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Abstract

The Analytical Country Reports analyse and assess in a structured manner the evolution of the national policy research and innovation in the perspective of the wider EU strategy and goals, with a particular focus on the performance of the national research and innovation (R&I) system, their broader policy mix and governance. The 2013 edition of the Country Reports highlight national policy and system developments occurring since late 2012 and assess, through dedicated sections:

- national progress in addressing Research and Innovation system challenges;
- national progress in addressing the 5 ERA priorities;
- the progress at Member State level towards achieving the Innovation Union;
- the status and relevant features of Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3);
- as far relevant, country Specific Research and Innovation (R&I) Recommendations.

Detailed annexes in tabular form provide access to country information in a concise and synthetic manner.
The reports were originally produced in December 2013, focusing on policy developments occurring over the preceding twelve months.

ACKNOWLEDGMENTS AND FURTHER INFORMATION

This analytical country report is one of a series of annual ERAWATCH reports produced for EU Member States and Countries Associated to the Seventh Framework Programme for Research of the European Union (FP7). ERAWATCH is a joint initiative of the European Commission's Directorate General for Research and Innovation and Joint Research Centre.

The Country Report 2013 builds on and updates the 2012 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between the national priorities and the structural challenges, highlighting the latest developments, their dynamics and impact in the overall national context.

The first draft of this report was produced in December 2013 and was focused on developments taking place in the previous twelve months. In particular, it has benefitted from the comments and suggestions of Mark Boden from JRC-IPTS. The contributions and comments from DG-RTD and Brian Ditcham, of the Department for Business, Innovation and Skills, UK are also gratefully acknowledged.

The report is currently only published in electronic format and is available on the ERAWATCH website. Comments on this report are welcome and should be addressed to jrc-ipts-erawatch-helpdesk@ec.europa.eu.

EXECUTIVE SUMMARY

The UK has the third largest population among the EU Member States, with 12.6% (63.9 million) of the total population of the EU-28. In terms of economic performance, in 2013 the UK is forecast to be responsible for 14.7% of the total GDP of the EU, contributing €2,014bn[1]. In contrast to the EU average, UK GDP is now showing some signs of a modest recovery. However, UK GERD in 2012 was £27bn (€31,395m), contributing some 12.47% of the aggregate R&D expenditure of the EU Member States – a current prices decrease of 2% over 2011, while UK R&D intensity was 1.72% in 2012, below the estimated EU average of 2.06%. UK BERD for 2012 was £17.1bn (€20.1m), down slightly from 2011 (£17.5bn) and GOVERD for 2012 was £2.2bn (€2.6bn)[2], also down from 2011. The Government's plans for austerity measures continue to be applied, although offset by targeted investments aiming at boosting industrial growth and longer term recovery.

In terms of HRST as a share of the total labour force, the UK ranks above the EU average: much of this scientific and technological labour force is found in the HE sector which comprises some 115 universities, plus colleges, etc. Together with the intramural research capabilities of some Government Departments and institutes and centres maintained by the Research Councils, these comprise the UK Research Base. This is responsible for the majority of UK research and development activity and performs above its weight in terms of the production of scientific papers, particularly in terms of attracting citations. However, the UK performs below the EU average in terms of its per capita patents output.

The Department for Business, Innovation and Skills (BIS) plays the lead executive role in research issues, and is the major provider of research funds for the public sector. This provides funds for the seven Research Councils, each organised on a broad disciplinary basis, which in turn support R&D both in Higher Education Institutes (HEIs), independent research organisations and in their own institutes. Thus, BIS has oversight for the majority of R&D policy formulation, and forms the main author of strategic policies for UK R&D and innovation, while the Research Councils will develop their own specific R&D strategies and policies.

The UK government provides support to research and innovation activities in the private sector through a number of mechanisms, including tax credits for R&D investment, and the work of the TSB, sponsored by BIS.

There have been no recent major changes in the institutional set-up of the innovation governance system, except for the closure of the Regional Development Agencies, which were replaced by Local Enterprise Partnerships (LEPs) throughout 2012/13. The TSB has largely assumed the functions of the RDAs and is, effectively, the UK's innovation agency.

Over the period 2012-2013, a number of new measures have been introduced and modifications made to existing measures. Most of these were announced as part of the 2011 Innovation and Research Strategy for Growth; the July 2013 Budget Statement by the Chancellor of the Exchequer confirmed support for these measures while the latest available BIS Annual Innovation Report (for 2012) charted the progress made with their implementation. In general these measures and changes address:

- Continuing to stimulate and support knowledge transfer and dialogue between all sectors of the UK innovation system, particularly between public sector research performers and businesses

[1] Eurostat (2012b) Annual National Accounts: GDP and main components. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_gdp_c&lang=en (Accessed, 14th December 2012)
[2] ONS Figures 12 March 2014.

- Targeted support on key emerging technologies with strong economic potential
- Increasing the accessibility and availability of financial support to SMEs, entrepreneurs and newly established companies, and improving the attractiveness of investing in R&D
- Providing more encouragement for activities relevant to innovation at a range of levels.

At the same time, the Government has continued its practice of assessment, evaluation and review in order to ensure it adheres to its longstanding commitment to evidence based policy-making.

According to the 2013 Innovation Union progress report[3], the UK remains one of the group of 'innovation followers', with strengths in the quality of research , but weaknesses in the introduction of innovations to the market.

Structural challenges facing the UK economy broadly concern its oversupply of low skilled workers, an undersupply of bank finance for industry, especially SMEs and the need for investment in transport and energy infrastructures.

The UK Government's 2012 Annual Innovation Report[4] paints a more positive picture in terms of the country's innovation performance: a strongly performing, well trained and well regarded research base, an attractive destination for foreign direct investment and comparatively good levels of innovation investment, although in some traditional innovation metrics the UK's performance is less good

In summary, the main structural challenges facing the UK tend to remain largely unchanged from previous years' analyses. These are:

- A continuing low level of private sector R&D investment, in all sectors of the economy;
- The need to maintain a continuing policy focus on the translation of the results of publicly supported R&D into commercial products, process and services;
- In the face of continuing economic pressures the need to maintain the present level of public funding of the science base;
- Uncertainties over the future supply of human resources in S&T (in the face of university teaching cuts and the introduction of higher student fees);
- Continuing pressure on the supply of venture capital for the growth and development of SMEs and start-ups.

According to the recent BIS Annual Innovation Report[5], the set of policies in place address the following objectives:

- Support innovation and research in business;
- Provide incentives for companies to invest in high-value business activities;
- Create a more open and integrated innovation ecosystem; and
- Remove barriers to innovation.

Overall, it appears that the current set of policy measures and actions in place are appropriate, efficient and largely effective in addressing the structural challenges faced by the UK R&I system.

[3] European Commission, Research and Innovation performance in EU Member States and Associated Countries, 2013. Available at: http://ec.europa.eu/research/innovation-union/pdf/state-of-the-union/2012/innovation_union_progress_at_country_level_2013.pdf#view=fit&pagemode=none
[4] BIS, 2012: http://www.bis.gov.uk/assets/biscore/innovation/docs/a/12-p188-annual-innovation-report-2012
[5] Ibid.

The current UK policy mix is also consistent with actions required in meeting the Innovation Union's key policy actions, in terms of strengthening the knowledge base and reducing fragmentation; getting good ideas to market, working in partnership to address societal challenges, maximising social and territorial cohesion, and international scientific cooperation.

In addition, they are also fully consistent with the five ERA priorities and objectives. The UK has a thriving and open labour market for researchers, it performs well in terms of cross border cooperation and the measures in place to facilitate it (although researchers must be based in UK organisations in order to qualify for support). It boasts a large number of world class research infrastructures and has a strategic plan for their development, research institutions have a high degree of autonomy (although the shortfall of funding for teaching may have negative effects), interaction between the public and private sector are well developed and supported by a broad mix of policies, the outputs of research are well disseminated and moves are underway to further increase access to knowledge and data, and international cooperation with third countries is extremely extensive and supported by a coordinated cross-government strategic approach.

An overall assessment of the policy mix would seem to suggest that, as reported last year, a balance is being maintained and that there have been some positive responses to the prevailing macroeconomic uncertainty. Economic signs are that the Government's growth policies appear to be resulting in some modest recovery.

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1 BASIC CHARACTERISATION OF THE RESEARCH AND INNOVATION SYSTEM

The UK has the third largest population among the EU Member States, with 12.6% (63.9 million) of the EU-28 total population of 505.7 million in 2013[6]. In terms of economic performance, in 2013 the UK is forecast to be responsible for 14.7% of the total Gross Domestic Product (GDP) of the EU (€14,014bn), with a GDP of €2,014bn[7]. UK GDP decreased 5.2% in 2009, increased 1.7% in 2010, 1.1% in 2011, 0.1% in 2012 and is forecast to have increased 1.3% in 2013 in comparison to the EU-27 average GDP rates of growth of -4.5% in 2009, +2.0% in 2010, +1.7% in 2011, -0.4% in 2012 and a forecast of 0.0% in 2013 respectively[8]. UK GERD in 2012 was £27bn (€31,395m), contributing some 12.47% of the aggregate R&D expenditure of the EU Member States – a current prices decrease of 2% over 2011, while UK R&D intensity was 1.72% in 2012, below the estimated EU average of 2.06%. UK BERD for 2012 was £17.1bn (€20.1m), down slightly from 2011 (£17.5bn) and GOVERD for 2012 was £2.2bn (€2.6bn)[9], also down from 2011.Very recent figures from the ONS show that UK GDP growth is accelerating, from +0.4% in 2013Q1, through +0.7% in 2013Q2 to +0.8% in 2013Q3. Growth was observed in all three sectors (services, production & construction).

However, the UK economy is still fragile - 2013Q3 GDP is estimated at 2.5% below its peak in 2008Q1 and from peak to trough in 2009, the economy shrank by 7.2%.

In terms of human resources in science and technology as a share of the total labour force the UK ranks well above the EU average (53.1% compared with 42.9%)[10].

Whilst the UK represents 0.9% of global population, 3.2% of R&D and 4.1% of researchers, it accounts for 9.5% of article downloads, 11.6% of citations and 15.9% of the world's mostly highly cited articles[11]. Amongst its comparator countries, the UK has overtaken the US to rank 1st by field-weighted citation impact (an indicator of research quality). Moreover, with just 2.4% of global patent applications, the UK's share of citations from patents (both applications and granted) to journal articles is 10.9%[12]. However, the UK has a relatively low level of patent applications and academic/corporate co-authored publications although "these metrics may say

[6] Eurostat (2013a) Demographic Balance and Crude Rates. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_gind&lang=en (Accessed 18th December 2013)
[7] Eurostat (2013b) Annual National Accounts: GDP and main components. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_gdp_c&lang=en (Accessed, 18th December 2013)
[8] Eurostat (2013c) GDP growth rate volume. Percentage change on previous year. Available at: http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tec00115&plugin=1 (Accessed, 18th December 2013)
[9] ONS Figures 12 March 2014.
[10] Eurostat (2013f). Human resources in science and technology as a share of labour force. Available at: http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tsc00025&plugin=1. (Accessed, 18 December 2013).
[11] BIS (2014). Insights from international benchmarking of the UK science and innovation system
[12] BIS (2013) International Comparative Performance of the UK Research Base – 2013

more about our industrial structure than the economic potential of UK knowledge assets" (BIS, 2014, op.cit.).

The Department for Business, Innovation and Skills (BIS) plays the lead executive role in research issues, and is the major provider of research funds for the public sector. This provides funds for the seven Research Councils, each organised on a broad disciplinary basis, which in turn support R&D both in Higher Education Institutes (HEIs), independent research organisations and in their own institutes. Thus, BIS has oversight for the majority of R&D policy formulation, and forms the main author of strategic policies for UK R&D and innovation, while the Research Councils have responsibility for developing their own specific R&D strategies and policies.

The UK government provides support to research and innovation activities in the private sector through a number of mechanisms, including tax credits for R&D investment, and the work of the TSB, which is sponsored by BIS and has responsibility for the formulation and delivery of the Government's technology strategy. Other Ministries and Departments, particularly the Department for Environment, Food and Rural Affairs, the Ministry of Defence and the Department of Health, also have significant research portfolios within their areas of responsibility, and commission R&D through their own laboratories and institutes.

There have been no recent major changes in the institutional set-up of the innovation governance system, except for the closure of the Regional Development Agencies, which were replaced by Local Enterprise Partnerships (LEPs) throughout 2012-13. These are consortia of local authorities and businesses which are responsible for economic development in each region. The TSB has largely assumed the functions of the RDAs and is, effectively, the UK's innovation agency; while not the only public sector agency responsible for innovation, it is the only one with a cross-economy, cross-sectoral remit, covering the whole UK.

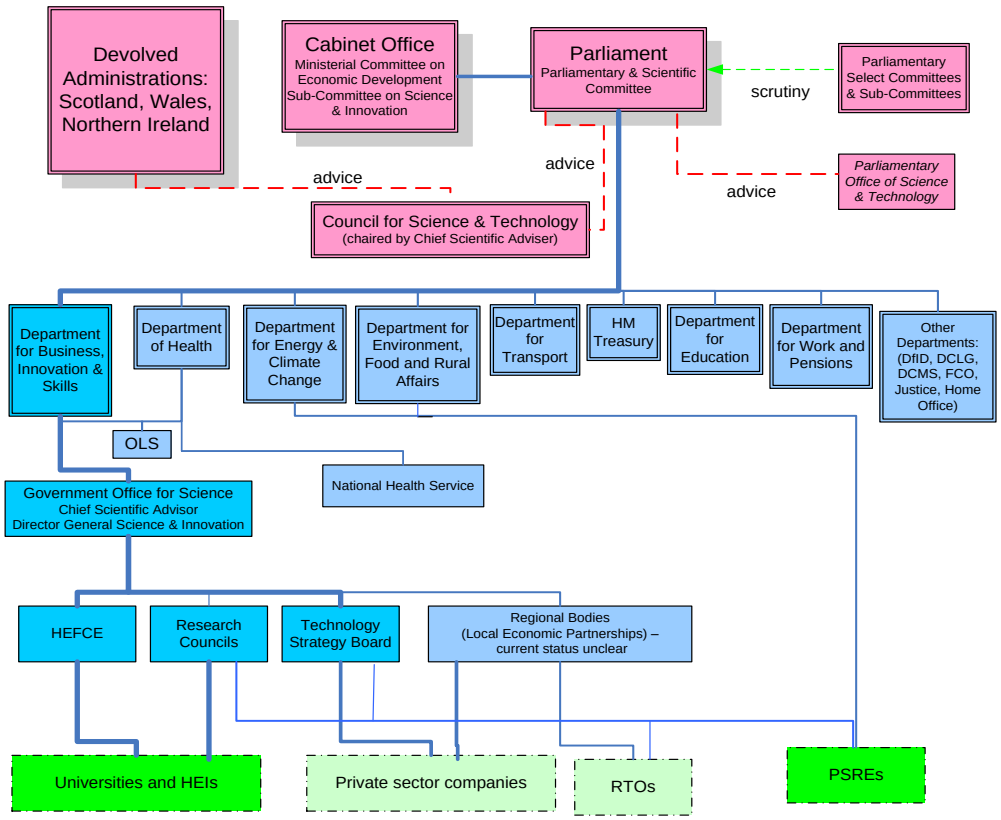
The main actors in the performance of UK public sector research are the HEIs, most of which are universities. The majority of their research funding is provided in the form of grants from the Research Councils, awarded to individual researchers as well as to longer running programmes, units and centres. Other funds, including research funding, in England, Wales and Scotland are provided by BIS through dedicated non-departmental funding councils. In Northern Ireland, funding for research comes directly from the Department for Employment and Learning, Northern Ireland (DELNI) (Cunningham and Karakasidou, 2009). In 2011-12, there were 163 HEIs in the UK of which 115 were universities. Despite a shift towards privatisation, a number of Government Departments have retained their intramural research capabilities in some form or other. Collectively, these form an important component of the science and engineering base, alongside the (much larger) component represented by the University sector. Apart from the physical scientific infrastructure, the UK's innovation infrastructure also includes the National Measurement System (NMS), the academic IT network, the UK's intellectual property regime and the UK's standards and accreditation system, plus major initiatives such as the Census of Population Programme.

Data from the EU R&D Scoreboard show that there were 107 UK companies in the top 2000 world companies (to which they contributed 4.2% of R&D investment) and 252 in the top 1000 EU companies. The UK is strongly represented in the sectors of Software and Computer Services (with 47 companies in the top 1000) and Pharmaceuticals and Biotechnology (with 30 companies in the top 1000)[13].

Figure 1 provides an overview schematic of the UK R&I system and its main components.

[13] European Commission, *The 2013 EU Industrial R&D Investment Scoreboard*. Luxembourg 2013.

Figure 1: The UK R&I System



Key:

DCLG: Department for Communities & Local Government
DCMS: Department for Culture, Media & Sport
DfID: Department for International Development
FCO: Foreign & Commonwealth Office
HEFCE: Higher Education Funding Council
HEIs: Higher Education Institutes
OLS: Office of Life Sciences
PSREs: Public Sector Research Establishments
RTOs: Research & Technology Organisations

Policy Level Bodies
Operational Level Bodies
Research Performers

2 RECENT DEVELOPMENTS OF THE RESEARCH AND INNOVATION POLICY AND SYSTEM

2.1 National economic and political context

During the period from late 2012 to 2013, the UK government has remained in the hands of the Conservative/Liberal Democrat coalition which entered office in May 2010 as the result of a hung parliament. The present government has a mandate until May 2015. At the regional level, a proposed referendum on Scottish independence is due on 18th September, 2014. The full political, economic and governance implications of a 'yes' vote are as yet unclear, as are the specific implications for the funding of Scottish research and innovation-related activities.

Overall, economically, the UK appears to be recovering slightly from the effects of the 2008 financial crisis and Eurozone uncertainty. The most recent economic and fiscal outlook from the Office for Budget Responsibility (OBR) was released in March 2012 and is somewhat out of date due to unanticipated improvements in the UK's economic performance.

Although Office for National Statistics (ONS) figures show that UK GDP grew by 0.7% in the second quarter to June 2013, up from 0.4% in the first quarter, and that growth was observed in all three sectors (services, production and construction), overall the view is that the UK economy is still somewhat fragile. The ONS revised growth down from 0.2% to 0.1% for 2012 as a whole, thus the economy is still 3.3% smaller than before the financial crisis. Nevertheless, economists appear to be optimistic for the rest of 2013 due to recent signs that the recovery is gaining momentum, despite some evidence of a slump in business investment, which fell by £786m (c. €983m) in the three months to June to around £28.7bn/c.€36bn (the second worst figure since the height of the recession in September 2009. At the same time, investment in machinery and equipment fell by £1.2bn (c. €1.5bn) to £9.8bn (c. €12.25bn). The current account deficit has also raised concerns, hitting £22bn (c. €27.5bn) in the first quarter of 2013, although it fell to £13bn (c. €16.25bn) in the second quarter.

On a more positive note, Government policies to stimulate the housing market may be having an impact since investment in the domestic sector increased by £1.2bn (c. €1.5bn) to £13.2bn (c. €16.5bn). Related to this, ONSD estimates show construction to have grown by 1.9% during the quarter (compared to a previous 1.4% estimate).

ONS data also indicate an increase in the household savings ratio from 4.4% up to 5.9% in the second quarter, while real household disposable income reversed its first quarter decline of 1.7% and increased by 1.5% in the three months to June. Household consumption grew for a seventh consecutive quarter, by 0.3% (an extra £661m (c. €826m)), although this was slightly lower than the ONS's original estimate of 0.4%. Manufacturing output exhibited its strongest performance for almost three years increasing by 0.9% in the second quarter, up from the previous 0.7% estimate.

The labour market also continued demonstrate strong performance: in the second quarter of 2013, the number of employed rose and there were declines in the number of unemployed and the number of economically inactive people aged from 16 to 64, compared with the first quarter.

When compared to the same quarter in 2012, 275,000 more people were in employment, 105,000 fewer were unemployed, and 52,000 fewer were economically inactive (aged 16 to 64)[14].

Despite these minor signs of a recovery, the Government is continuing its programme of austerity measures in order to reduce public sector borrowing alongside measures intended to stimulate growth. According to a statement by the Chancellor of the Exchequer in July 2013, the Government's tax and spending plans include the following actions:

- £5bn (c. €6.25bn) investment in infrastructure until 2015, including guaranteed financing of up to £40m (c. €50m) for major infrastructure projects and policy reforms to stimulate new private sector investment in energy generation.
- Building on existing capital spending which exceeds the amount committed at the Spending Review 2010 by £1.4bn (c. €1.75bn).
- Continuing to protect the £4.6bn (c. €5.75bn) per annum funding for science and research programmes in cash terms during the spending review period.
- Increasing access to finance for business - through continuing the Funding for Lending Scheme giving households and businesses greater access to finance by offering strong incentives to banks and building societies to boost their lending, and by creating a £1bn (c. €1.25bn) Business Bank to help smaller businesses access finance and support.
- Increasing the UK's exports and supporting inward investment: From September 2013, buyers of UK exports will be offered a direct loan facility up to £1.5bn (c. €1.88bn) for 3 years, giving SMEs the certainty to bid for contracts.
- Introducing a temporary (2 years) increase in the Annual Investment Allowance, from £25,000 (c. €31,250) to £250,000 (c. €312,500) to encourage SMEs to invest in plant and machinery.
- A further cut will be made to the main rate of corporation tax from 23% to 20% in April 2015, giving the UK the joint lowest rate of the G20 nations.
- To simplify business regulation, the Government introduced a '1 in 2 out' system in January 2013, under which no new regulation may be introduced unless it is off-set by deregulation of twice the equivalent value. The net cost of domestic regulation on business has already fallen by around £840m (c. €1,050m) per year. The Government aims to reduce or abolish at least 3,000 regulations through the Red Tape Challenge by 2015.
- In education, the Government is providing funding for up to 180 new Free Schools, 20 new Studio Schools and 20 University Technical Colleges a year. There are now more than 3,000 academies and Free Schools, as well as more than 20 University Technical Colleges and Studio Schools, with another 68 due to open from September 2013 onwards.
- In terms of regional economic development, the Government aims to increase the level of resources available under strategic influence of Local Enterprise Partnerships (LEPs) to at least £20bn (c. €25bn) by 2021. In addition, 24 Enterprise Zones have been established, which have secured almost £229m (c. €286m) of extra private sector investment. The first wave of City Deals have been concluded eight major English cities, with the planned creation of an estimated 175,000 jobs and 37,000 new apprenticeships

[14] http://www.ons.gov.uk/ons/rel/lms/labour-market-statistics/september-2013/statistical-bulletin.html#tab-Summary-of-Labour-Market-Statistics

over the next 20 years. Around £2.4bn (c. €3bn)has been allocated through the Regional Growth Fund to 300 projects and programmes, which have pledged to deliver 500,000 jobs and £13bn (c. €16.25bn) of private sector investment.

2.2 Funding trends

2. 2.1. Funding flows

Table 1. Basic indicators for R&D investments*

	2009	2010	2011	2012	EU (2012) **
GDP growth rate	-5.2%	+1.7%	+1.1%	+0.1 %	-0.4%
GERD (% of GDP)	1.82	1.77	1.78	1.72	2.06
GERD (euro per capita)	468.2	491.9	500.6	523.9	525.8
GBAORD - Total R&D appropriations (€ million)	10,518	10,793	10,438	11,235	90,690
R&D funded by Business Enterprise Sector (% of GDP)	1.10	1.08	1.13	1.09	1.3
R&D performed by HEIs (% of GERD)	1.3	1.2	1.2	1.1	0.9 (2011)
R&D performed by Government Sector (% of GERD)	32.6	32.3	30.5	28.9	33.4 (2011)
R&D performed by Business Enterprise Sector (% of GERD)	44.5	44.0	45.9	45.6	54.9 (2011)
Share of competitive vs. institutional public funding for R&D	n/a	n/a	n/a	n/a	n/a
Venture Capital as % of GDP (*Eurostat table code tin00141)*	0.056	0.047	0.048	0.038	n/a
Employment in high- and medium-high-technology manufacturing sectors as share of total employment *(Eurostat table code tsc00011)*	4.87 (2008)	n/a	n/a	n/a	6.69% (2007)
Employment in knowledge-intensive service sectors as share of total employment (*Eurostat table code tsc00012)*	42.74% (2008)	n/a	n/a	n/a	32.96% (2007)
Turnover from Innovation as % of total turnover *(Eurostat table code tsdec340)*	7.3% (2008)	n/a	n/a	n/a	13.3% (2008)

* The 2012 data will be added once the December 2013 data will be released

**The EU27 (or 28 as far available) average data will be provided by IPTS in December 2013.

From the above Table, it is clear that the overall effect of the financial crisis has been to some extent reversed, with a slight increase in the rate of growth of GDP (recent estimates indicate that the rate of recovery and GDP growth is exceeding earlier forecasts). Due to the variations in GDP, it is difficult to assess any significant trend in research intensity although GERD is steadily rising, alongside an overall upward trend in GBAORD. Business sector R&D expenditure also seems to be slowly picking up (but again the picture is not clear due to the changes in GDP), with a modest increase in terms of its ratio to GERD. However, Government sector funded GERD is continuing to decline. Total Venture Capital provision also seems to have been adversely affected by the financial crisis and is yet to show signs of recovery, although since this is provided through both public and private sector routes, it does not specificxally reflect a change of government investment (see below).

Overall, since the UK Government allocates funds within a strategic framework for research and innovation investment, funding is somewhat insulated by the effects of the financial downturn. Moreover, the government has adopted an investment for growth approach to economic recovery.

2.2.2. Funding mechanisms

2.2.2.1 Competitive vs. institutional public funding

According to Cunningham, et al. (2011)[15], the R&D tax credit schemes for SMEs and for large companies collectively make up the largest proportion (around 75%) of the innovation budget. However, if the entire portfolio of public support for research and innovation is examined (see Table 2), which includes the recurrent funding included in the Science Budget for the support of the Research Base, this percentage is much lower (around 11%). On the other hand, if research and innovation support is restricted to business-focused innovation support measures, then the tax credit proportion (which also includes other framework measures, in addition to tax credits) increases to around 45-49%, although still short of the claimed 75%[16].

Table 2. Real expenditures on policy priorities: Figures for 2012 have not been included as actual expenditures are as yet unknown and only allocated budget figures are available. Figures in brackets represent share of entire Government expenditure on research and innovation, figures without brackets represent share of 'business innovation' budget.

	2010	2011
Innovation-friendly environment including tax incentives	45.5% [10.9%]	48.6% [11.5%]
Technology and knowledge transfer and cluster cooperation	8.0% [1.9%]	9.6% [2.3%]
Creation and growth of enterprises	10.4% [2.5%]	11.2% [2.6%]
Intellectual Property	0% [0%]	0% [0%]
Infrastructure for Research and Innovation	21.7% [5.2%]	15.8% [3.7%]
Human Resources for research and innovation	5.6% [51.3%]	6.0% [50.9%]
R&D	1.3% [26.4%]	0.8% [27.1%]
Demand-side interventions	7.5% [1.8%]	8.0% [1.9%]
TOTAL	100%	100%

Source: Cunningham, P. and Sveinsdottir, T. (2012).

[15] Cunningham, P., Sveinsdottir, T. and Gok, A. (2011) ERAWATCH COUNTRY REPORTS 2011: United Kingdom.
[16] Cunningham, P. and Sveinsdottir, T. (2012). Innovation Policy Trends in the United Kingdom. INNO-Policy TrendChart Report. Technopolis.

Due to the nature of the public sector research base, it is not possible to distinguish precisely between funding streams to public research organisations and HEIs: many UK PROs operate mixed governance models and are eligible to compete for public research funding and contract research funding from the public and private sectors. A simple illustration can be obtained by comparing the level of funding provided by the UK Research Councils (largely made up of competitive mode funds, although distributed via a range of project, centre and institutional grants) and the Higher Education Funding Councils (which contribute the so-called block grant to HEIs according to allocations determined by the Research Assessment Exercise/Research Excellence Framework). Thus, in 2011-12, the UK Research Councils allocated some £3,194m (c. €3,895m) whilst the Higher Education Funding Councils allocated £2,257m (c. €2,752m), a ratio of about 58% to 42%. These relative proportions have remained largely stable over a number of years[17].

2.2.2.2 Government direct vs indirect R&D funding[18]

The balance of direct to indirect R&D funding is described in the above section. Precise figures are not available to provide a precise picture of any trends in the balance of this funding over time, although since there is some evidence that, at least in the early stages of the schemes that companies increased their uptake of the R&D Tax Credits, it is likely that the balance of expenditure has slightly increased in favour of indirect schemes[19].

While the UK Innovation Investment Fund increased from £6.2m (c. €7.6m) to £11.9m (c. €14.5m) between 2010 and 2012, it forms a relatively minor proportion of the Government's portfolio of venture capital stimulation measures, most of which remained more or less static in terms of the absolute value of their funds.

Finally, no single scheme is in operation which provides funding to cover the entire value creation chain from fundamental research through to market innovation.

2.2.3 Thematic versus generic funding

Table 3 shows the distribution of GBAORD by specific thematic objectives.

Thematic Objective	Expenditure (€m) 2011	%
Exploration and exploitation of the earth	351.6	3.3
Environment	315.8	3.0
Exploration and exploitation of space	304.6	2.9
Transport, telecommunications and other infrastructure	197.5	1.9
Energy	89.9	0.9
Industrial production and technology	18.4	>0.1
Health	2,221.7	21.3

[17] Department for Business, Innovation and Skills (2013). Science, Engineering and Technology Statistics 2013. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/246231/13-499-set-statistics-2013A.pdf

[18] Government direct R&D funding includes grants, loans and procurement. *Government indirect R&D funding* includes tax incentives such as R&D tax credits, R&D allowances, reductions in R&D workers' wage taxes and social security contributions, and accelerated depreciation of R&D capital.

[19] HMRC, 2010. An Evaluation of Research and Development Tax Credits. HMRC Research Report 107. Available at: http://www.hmrc.gov.uk/research/report107.pdf

Agriculture	412.0	3.9
Education	38.7	>0.1
Culture, recreation, religion and mass media	201.1	1.9
Political and social systems, structures and processes	150.8	1.4
General advancement of knowledge financed from General University Funds	2,601.3	24.9
General advancement of knowledge financed from other than General University Funds	2,015.5	19.3
Defence	1,519.4	14.6
TOTAL	**10,438.6**	**100.00**

Source: Eurostat, 2013.

2.2.4 Innovation funding

The UK has for many years taken a holistic view of innovation, with the explicit understanding that it can extend beyond the area of purely R&D funding alone, embracing a range of activities that can also impinge upon the innovation process (such creativity, design, etc.).

This comprehensive definition makes it very difficult to distinguish between budgetary flows that specifically target research and those that deal with innovation.

On this specific issue, the recent "*Insights from international benchmarking of the UK science and innovation system*" (BIS, 2014) notes that there are significant definitional issues associated with innovation (in sense of "innovation beyond R&D"). The authors note that:

> "*Whilst it would be desirable to follow the same pattern as for the R&D statistics and compare total innovation spending, and its public and private sector constituents, no estimate of total innovation spending across nations has been identified.*
>
> *It is similarly challenging to produce a definitive view on the amount of public sector funded innovation spending. Our best interpretation of the different data sources is that, for most comparator countries, some public sector support for innovation (such as, for example, the expenditure of the Technology Strategy Board (TSB) in the UK) is already included in the R&D figures. Overall, the picture from these proxies is mixed and is not easily reconciled with the more anecdotal evidence gathered from country sources." (BIS, 2014).*

Following the above example, if one assumes that the majority of 'innovation' funding targeting business organisations is represented by the combined budgets of the TSB programmes, this offers a figure of around £440m (c. €530m). Contrasting this with 'research funding' targeting HEIs, plus a substantial part of the budget of UK PROs, which originates from the HE funding bodies (£3,194m – c. €3,848m) and the Research Councils (£2,257m – c. €2,719m), this provides a ratio of research spending to 'innovation' spending of 92.5%:2.5%.

2.3 Research and Innovation system changes

During the period 2012-13, the most significant change in the UK policy delivery landscape, although not restricted purely to innovation, was the closure of the Regional Development Agencies, which were responsible for some innovation support, most significantly the delivery of the Grant for R&D programme (now Smart). Their closure was announced in the 2010 Budget shortly after the 2010 general election. As a result of this closure the Technology Strategy Board has now taken responsibility for the Smart scheme nationally. The RDAs met the target of operational closure by March 2012 and were formally abolished in July 2012. The role of the

RDAs is to some extent, being taken over by Local Enterprise Partnerships, of which there were 39 in place as of September 2013[20].

One other change to the innovation landscape is the continued opening of more Catapult Centres and Innovation and Knowledge Centres, both of which provide further sets of actors within the overall knowledge transfer interface.

2.4 Recent Policy developments

The previous Country Report (Cunningham, P.N. and Sveinsdottir, T., 2012) outlined those new measures that were introduced and the modifications made to existing measures over the period 2011-2012. Most of these were announced as part of the 2011 Innovation and Research Strategy for Growth (IRS). This provides the strategic framework for the Government's ongoing plans for innovation and research policies. This operates alongside the UK Industrial Strategy[1], which has identified a number of sectors of crucial importance for the growth of the UK economy[2].

The Government's Autumn Budget statement in November 2012 announced an additional £600m (c. €730m) of funding for research. Details on how this was to be spent were provided in a Ministerial Statement in January 2013. It includes:

- £189m (€230m) for big data and energy efficient computing
- £25m (€30m) for space
- £35m (€43m) for robotics and autonomous systems
- £50m (€107m) for synthetic biology
- £20m (€24m) for regenerative medicine
- £65m (€37m) for national research and innovation campuses
- £45m (€89m) for advanced materials
- £30m (€37m) for energy storage

The £600m also includes funding for state of the art infrastructure and instrumentation.

As noted above, the most recent broad policy statement on Government spending was the 'Spending Review 2013', in June 2013, which sets out how the government will spend £740bn (c. €925bn) of tax-payers' money between April 2015 and April 2016. The previous Spending Review took place in 2010.

In terms of science and innovation, the key points include[21]:

Continued maintenance of the resource funding for science, in cash terms, at £4.6bn (c. €5.75bn) in 2015-16, with an increase in capital funding, in real terms, from £0.6bn (c. €0.75bn) in 2012-13 to £1.1bn (c. €1.375bn) in 2015-16. The long-term capital budget for science in the next Parliament is set to grow in line with inflation to 2020-21.

[20] http://www.lepnetwork.org.uk/leps.html

[21] Full document available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209036/spending-round-2013-complete.pdf

The budget line for departmental programmes and administration for the Department for Business, Innovation and Skills (the key government actor and funder for research and innovation policy) will fall from £13.6bn (c. €17bn) for 2014-15 to £13bn (c. €16.25bn) in 2015-16, a 5.9% fall. However, its capital budget will rise from £2.1bn (c. €2.625bn) to £2.5bn (c. €3.125bn) over the same period, an increase of 15.3%.

Additional resource funding of £185m (c. €231m) will be provided to the Technology Strategy Board (TSB) to support innovation, including the setting up and support for Catapult Centres and the Biomedical Catalyst. Co-funded by the Medical Research Council, the latter is a programme in the area of Life Science innovation which supports SMEs and researchers in providing solutions to healthcare problems. Three levels of funding are available: Feasibility Funding Awards, Early Stage Awards and Late Stage Funding Awards.

Catapult Centres are intended to provide businesses with access to:

- "Specialist technical expertise and skills needed across the sector from SMEs, supply chains and tier one companies, particularly multidisciplinary expertise;
- High value capital equipment, facilities and infrastructure beyond the affordability of individual companies;
- Technology and sector leadership and an independent "repository of knowledge; and
- Long-term investment in technology platforms or demonstrators beyond the normal business planning horizons"

Seven Catapult Centres are planned in: High Value Manufacturing; Cell Therapy; Offshore Renewable Energy; Satellite Applications; Connected Digital Economy; Future Cities and Transport Systems. All are in various stages of operation. The additional funding will support a further two Catapults to be established in 2015/16: in Energy Systems and in Diagnostics for Stratified Medicine, while an extra £7m (c. €8.75m) is to be invested in the High Value Manufacturing Catapult to capitalise on its early success.

The Graphene Global Research and Technology Hub is still in the process of formation: a £45m (€55m) National Institute of Graphene Research has been established at the University of Manchester (due to be fully operational by 2016), while early in 2013 £20m (€24m) has been invested into support for research into graphene engineering and a further £10m (€12m) into research for manufacturing processes and technologies linked to graphene.

Following the development of 'A Synthetic Biology Roadmap for the UK'[22] (2012), the Synthetic Biology Leadership Council (SBLC)[23,24], co-chaired by the Minister for Universities and Science, has been formed as a strategic co-ordinating body for the UK's interests in the rapidly developing field of SynBio. In total over £100m (€120m) has been committed to SynBio R&D, including some £60m (€73m) which has been announced[25] as a £10m (€12m) investment in a national Innovation and Knowledge Centre, which has leveraged a further £18m (€22m) from collaborating universities and companies; £20m (€24m) to fund a new set of multi-disciplinary research centres, a £10m (€12m) investment from UK government, through BBSRC into the Rainbow Seed Fund (for venture funding in SynBio spin outs and start-ups); and £18m (€22m) funding has been allocated for creating a future UK DNA Synthesis facility.

[22]https://connect.innovateuk.org/documents/2826135/3815409/Synthetic+Biology+Roadmap+-+Report.pdf/fa8a1e8e-cbf4-4464-87ce-b3b033f04eaa

[23] https://connect.innovateuk.org/web/synthetic-biology-special-interest-group/synbio-leadership-council

[24] https://www.gov.uk/government/policy-advisory-groups/synthetic-biology-leadership-council

[25] https://www.gov.uk/government/news/over-60-million-for-synthetic-biology

The Research Partnership Investment Fund (RPIF) has been extended until 2016-17, providing at least £100m (c. €125m) of matched funding each year to leverage private investment in science infrastructure. The scheme, which is managed by the Higher Education Funding Council for England, provides funding for large capital research projects of between £10-35m (€12-42m).

An expansion of the Small Business Research Initiative (SBRI) was announced. The scheme, which supports SMEs in providing innovative public sector solutions, will see £100m channelled through the scheme in 2013-14 and all Government departments will be expected to expand their use of the scheme. Specific targets for key departments for 2013-14 have been set out, including £50m (c. €62.5m) from the Ministry of Defence and $30m (c. €37.5m) from the National Health Service.

The March 2013 Budget contained an announcement that the 'above the line' R&D tax credit relief rate will be increased to 10%. Thus the credit will be accounted for in a company's profit and loss account rather than in the company's tax line ('below the line' - as currently done). This is thought to be more effective at influencing investment behaviour and should also help to attract additional R&D activity to the UK. The Budget also contained news that, as part of its Industrial Strategy, a UK-wide £1.6bn (c. €2bn) fund would be introduced (over 10 years) in order to support sectors, including aerospace, automotives, life sciences, nuclear and oil and gas. In response to a review by Lord Heseltine into the prospects for increasing wealth creation in the UK[26], the Government has committed to the creation of a Single Local Growth Fund (SLGF) in 2015-16. Funding will be provided from existing Departmental settlements. Further details are set out in Investing in Britain's Future[27]. The main points set the direction for the devolution of government spending to local areas, including empowering Local Enterprise Partnerships (LEPs) and the devolution of some central funding streams into a single pot from 2015 onwards; a further £350m (c. €437.5m) for the Regional Growth Fund, of which £100m will come from existing budgets; and a package of regulatory changes to improve how regulations that affect businesses are enforced, together with a One-In Two-Out rule on regulation which came into force in January 2013.

The Director General for Knowledge and Innovation at BIS has launched a consultation on the key priorities and challenges for the science and research budget in forthcoming spending decisions for the 2015 to 2016 financial year. Various stakeholders have been invited to respond, including the Confederation of British Industry (CBI), the Chief Scientific Advisers Committee, Council for Science and Technology, and the National Academies, together with any further interested bodies.

2.4 National Reform Programme 2013 and R&I

The national Reform Programme 2013 for the UK sets out a number of broad aims and commitments related to research and innovation. In very broad terms these include: "to ensure support for curiosity driven research in universities and the wider knowledge base that will foster scientific and technological breakthroughs; to nurture innovation in all its forms by encouraging stronger links between entrepreneurs, researchers and experts in design, intellectual property, measurement and standards; and to establish an open environment where the most promising

[26] No Stone Unturned: in pursuit of growth. Heseltine Review, March 2013. https://www.gov.uk/government/publications/no-stone-unturned-in-pursuit-of-growth

[27] HM Treasury, Investing in Britain's Future. CM 8669, Her Majesty's Stationery Office, June 2013. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209279/PU1524_IUK_new_template.pdf

ideas are rewarded by promoting open innovation and making data and research findings widely available".

The Government's Innovation and Research Strategy for Growth (IRS) is the key policy document underpinning these aims and commitments and details the policies by which they will be achieved. Alongside this is the UK Industrial Strategy28 announced in September 2012, which includes ten Sectoral Strategies. This also outlines a number of actions. The 2013 NRP reports on progress against these actions and policies. In addition, investments in R&D are also described.

Overall, it appears that substantial progress has been achieved, particularly when viewed in the broader economic environment of the financial downturn. In part, this can be attributed to recognition that austerity and debt reduction must be balanced by opportunities for future growth and that research and innovation have a critical role in driving such economic growth and recovery.

2.5 Recent evaluations, consultations, foresight exercises

A 2012 evaluation of Designing Demand identified strong returns to business, both actual and anticipated: for every £1 businesses invest in design, increased revenues of over £20 can be anticipated with an increase of over £4 in net operating profit and over £5 in exports. There were also reported boosts to confidence, strategic thinking, brand and business identity, and the creation or safeguarding of 2,460 net FTE jobs as a direct result of the programme. The evaluation found a potential return on investment of £3.75 in Net Value Added per £1 of public money spent. The evaluation also identified benefits to the design industry, with most of the participating businesses acknowledging a commitment to ongoing investment in design as a core business function[29].

Monitoring and evaluation plans for the catapult Centres are being developed by TSB.

In July, 2013 BIS released the first annual monitoring report on progress on the Regional Growth Fund (RGF)[30], covering Rounds 1 and 2 and the period up to 31 March 2013. It analyses data and uses case studies to show progress on: agreeing final terms with selected projects and programmes, money made available to bidders, private sector investment and jobs created.

In addition to specific evaluations, a number of broader and focused reviews have been conducted over the past year:

The annual (2012) HE-BCI survey[31] examined the exchange of knowledge between universities and the wider world in order to inform the strategic direction of 'third stream' activity undertaken by funding bodies and HEIs in the UK. The surveys collect financial and output data per academic year, summarise the results and provide information on a range of activities, from

[28] https://www.gov.uk/government/policies/using-industrial-strategy-to-help-the-uk-economy-and-business-compete-and-grow

[29] Department for Business, Innovation and Skills, Annual Innovation Report: Innovation Research and Growth, November 2012

[30] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/212280/13-p189-regional-growth-fund-annual-monitoring-report-2013.pdf

[31] http://www.hefce.ac.uk/whatwedo/kes/measureke/hebci/

the commercialisation of new knowledge, through the delivery of professional training, consultancy and services, to activities intended to have direct social benefits.

In February 2013, an evaluation report on the Enterprise Finance Guarantee (EFG) was published by BIS[32]. The EFG was launched in January 2009, and had supported over 20,000 SMEs at the time of the report's release. The report analyses the effectiveness of the EFG, comparing other borrowers and non-borrowers to assess the extent that EFG contributed to the businesses' success. A 2009 test group was chosen to allow sufficient time to observe the impact of the scheme using a variety of indicators, including changes to employment, sales, productivity and exports.

BIS released an analytical note in March 2013[33] to explain the economic rationale for an Open Access (OA) policy. The note recognises that OA enables open innovation and encourages exploration across applications, together with fostering multi-disciplinary work and collaboration. The note also contains a framework for comparing the outcomes of alternative policies to expand access to scholarly research and uses this to compare the costs of alternative policies for OA in the UK. The note concludes that a mandate for publicly funded (Research Council) research to be published by Gold OA may deliver better cost-effectiveness in the long-term and, although it would cost around 1% of the Science Budget, should deliver a significant change in open access above current levels.

In January 2014 Government responded[34] to the Finch Group's report 'Review of progress in Implementing the Recommendations of the Finch Report' (published October 2013)[35]. The report detailed the progress made on OA policy in the UK since the publication of the initial Finch Report in June 2012 and gave recommendations for continued implementation of the OA policy. The response covers four themes: policy, cost and sustainability, international considerations and future developments. Government welcomes the co-ordination role that Universities UK (UUK) is taking on for the continued implementation of OA policy in the UK.

The Research Councils produce annual impact reports. These reports contain case studies of impact as well as a common set of input, outcome and impact metrics, for example, the AHRC/Design Council study on the value and impact of design, published in August 2012. The report found that the design research community plays a key role in economic and social value creation but faces challenges in terms of the measurement of the value of design, evidence-gathering and business and policy partnerships. Another example would be the ESRC published a report 'cultivating connections: innovation and consolidation in the ESRC's impact evaluation programme', published in April 2013, which summarises a number of impact studies in recent years.

As a contribution to the wider policy debate concerning plans to bring the UK out of the economic downturn of 2008, and the options presented by austerity and stimulus measures, NESTA produced a policy discussion document in September 2012. This outlined 12 recommendations for recovery[36].

[32] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/85761/13-600-economic-evaluation-of-the-efg-scheme.pdf
[33] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/142814/bis-13-689-open-access-economic-analysis-of-alternative-options-for-the-uk-science-and-research-system.pdf
[34] http://www.researchinfonet.org/wp-content/uploads/2013/02/BIS-Transparency-Letter-to-Janet-Finch-One-Year-On-Response-January-2014.pdf
[35] http://www.researchinfonet.org/wp-content/uploads/2013/02/Final-version.pdf
[36] http://www.nesta.org.uk/areas_of_work/economic_growth/plan_i/assets/features/plan_i_report

In March 2013, BIS produced a report on "Research Councils impact reports 2012: descriptive analysis of quantitative metrics"[37]. This used Research Council performance data to identify trends and monitor developments in publicly funded science and research investment. "It summarises performance data from the seven Research Councils collected through their annual impact reports, and explains how to interpret and use this data to identify trends and monitor developments. The report specifically looks at the quantitative element of the performance metrics which refer to recent activities outputs rather than the wider economic and social impacts of past investments in research". The metrics used provide an overall picture of some of the activities and investments funded by Research Councils in the previous year and include inputs, outputs and outcomes, covering activities including expenditure, human capital, technology and knowledge exchange.

In the same month, BIS released an analytical note to explain the economic rationale for an open access policy[38]. It defined 'Open access' as the ability to download, read and print electronically published refereed journal articles, leaving aside research content that is publicly accessible in other formats. The note recognises that open access enables open innovation and encourages exploration across applications, together with fostering multi-disciplinary work and collaboration. The note also contains a framework for comparing the outcomes of alternative policies to expand access to scholarly research and uses this to compare the costs of alternative policies for open access in the UK. The note concludes that a mandate offering all articles attributable to publicly funded Research Councils in Gold open access (where authors publish in an open access journal that provides immediate open access to all its articles on the publisher's website) would be cost-effective and, although it would cost around 1% of the Science Budget, it will deliver a significant change in open access above current levels.

In December 2013, BIS published a report and supporting annexes, commissioned from Elsevier, into the international comparative performance of the UK research base. The report examines how the UK research base compares internationally, and what trends might affect the UK's future standing as a world-leading research economy39.

Other important reviews and consultations would include the Wilson review of university-business collaboration published in February 201240, the House of Commons Science and Technology Committee report "Bridging the valley of death: improving the commercialisation of research"41 published in March 2013, Sir Andrew Witty's review of Universities and Growth 2013 and Sir Michael Heseltine's report, "No stone unturned in the pursuit of growth"42 also published in March 2013.

[37] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/82802/bis-13-p175-research-councils-impact-reports-descriptive-analysis-of-trends-using-metrics.pdf

[38] https://www.gov.uk/government/publications/open-access-economic-analysis-of-alternative-options-for-the-uk-science-and-research-system

[39] https://www.gov.uk/government/publications/performance-of-the-uk-research-base-international-comparison-2013

[40] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32383/12-610-wilson-review-business-university-collaboration.pdf

[41] http://www.publications.parliament.uk/pa/cm201213/cmselect/cmsctech/348/348.pdf

[42] https://www.gov.uk/government/publications/no-stone-unturned-in-pursuit-of-growth

2.6 Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3)

Both the concept and the fundamentally 'local – global' character of Smart Specialisation has been acknowledged and accepted by national agencies in the UK and it is recognised that an effective system of coordination is required both from the top-down and from bottom up. This will entail government working with local partners, such as the Local Enterprise Partnerships (LEPs) (in England) to develop mechanisms for aligning national/local leadership team(s) and decision-making. This will ensure that national funding initiatives complement and are complemented by any devolved activities at the local level and that national and regional strengths and challenges are addressed equally.

Many of the innovation support activities already in operation in the UK already fit broadly within the concept of Smart Specialisation and the Government is seeking to identify and fill any gaps or disconnections. Although the Government sees little major benefit arising from a 'stand-alone' Smart Specialisation Strategy at the UK level, the real value of Smart Specialisation is seen as an ongoing process of learning, continually driving more productive and sustainable investments in innovation at all levels.

In this context, the role of the UK Innovation and Research Strategy (IRS) acts as a sound base with strong political, institutional and financial backing. These will also be significant partners in terms of matched funding in relation to the EU SIF Funds. Also, in the national context, the UK Industrial Strategy and the recently published Sector Strategies acknowledge the importance of the spatial dimension in influencing growth and innovation policy and the means of its delivery.

At the local level, the Local Enterprise Partnerships (LEPs) are of particular relevance to the notion of Smart Specialisation. LEPS are now well on the way to developing their activities in order to fill the 'regional' gap in driving 'place-based' innovation left by the closure of the Regional Development Agencies. They vary enormously in terms of size, scale, coherence (both geographical and partnership maturity), ambitions and capability, reflecting the heterogeneity of economic, social and infrastructural conditions across England. The UK Government recognises the role of LEPS in driving the local growth and innovation agenda; consequently, they are to lead in the preparation of place-based growth-orientated Single Local Growth Strategies, which will be supported with semi-competitive allocations from the Single Local Growth Fund[43].

LEPs and their partners are strongly encouraged to be part of this strategic policy framework, since this will facilitate access to support from the EU SIF funds (currently over €6.2bn for England for the period 2014-20) for activities that aim to add value to, and also benefit from, nationally funded activities whenever these are delivered at the local level. Other relevant actors at the regional/local level are universities, councils, and various sub-national networks, clusters and alliances – often focusing on particular sectors, functions or client/member groupings. Hence, the recognised need for coordination and capacity at national and local levels and between these levels. Part of the Government's assessment process for local funding will seek to assess the extent to which LEPS have sought to establish strong collaborative leadership.

The main message is that the Government believes that there is no need for local partners to develop a stand-alone strategy for Smart Specialisation, neither is it likely to be a requirement to

[43] Richardson, K. and Korou, A. Smart Specialisation and the LEP based model across England. Presentation made 25 June 2013, Department for Business, Innovation & Skills.

release funding[44]. However, "LEPs and partners are free to choose if they wish to develop a 'stand-alone' strategy of Smart Specialisation and to have it submitted for formal peer review and assessment by the EC's JRC Support Platform [England and several LEPs are now members of the Platform]. This will provide for a high level of rigour and international authority. The ongoing process of Smart Specialisation will help also to provide a sound basis upon which to make revised proposals as the programme develops but there is no longer any requirement in the revised draft Regulations for such stand-alone strategies at any stage"[45]. Thus many local actors are undertaking activities that might be described as Smart Specialisation, but these take place within the general context of local and regional innovation development and are not necessarily labelled as such. Nevertheless, there are now many particularly interesting developments from a number of LEPS across England in terms of developing 'Smart Specialisation' approaches. Across the UK as a whole, there is, as yet, no consistent approach with the devolved administrations of Northern Ireland, Scotland[46] and Wales all preparing strategies.

[44] BIS: pers.comm. and derived from "Smart Specialisation: Messages for national and local partners: Updated workshops held in Birmingham on 16th November 2012"

[45] HM Government, Framework of European Growth Programme Policies: Background Analysis, July 2013. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/232306/13-1049ann-framework-of-european-growth-programme-priorities.pdf

[46]http://www.sdi.co.uk/~/media/SDI/Scotland%20Europa/Resources%20Public/Regional%20Rural%20Urban/Scotland%20Europa%20Developmental%20Guide%20and%20Factsheet%20for%20Smart%20Specialisation.pdf

3 PERFORMANCE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM

3.1 National Research and Innovation policy

Table 4: United Kingdom: Key research and innovation indicators.

Human Resources	
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	2.32 (2011) [1.69]
Percentage population aged 30-34 having completed tertiary education	45.8% (2011) [34.6]
Open, excellent and attractive research systems	
International scientific co-publications per million population	989 (2011) [300]
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	13.3 (2008)
Finance and support	
R&D expenditure in the public sector as % of GDP	0.64 (2012) [0.74]
Public Funding for innovation (innovation vouchers, venture/seed capital, access to finance granted by the public sector to innovative companies)	n/a
FIRM ACTIVITIES	
R&D expenditure in the business sector as % of GDP	1.09 (2012) [1.26]
Venture capital and seed capital as % of GDP	pre-2007 statistics only
Linkages & entrepreneurship	
Public-private co-publications per million population	79 (2011) [53]
Intellectual assets	
PCT patents applications per billion GDP (in PPS€)	3.4 (2009) [3.8]
PCT patents applications in societal challenges per billion GDP (in PPS€) (climate change mitigation; health)	0.72 (2008) [0.91]
OUTPUTS	
Economic effects	
Medium and high-tech product exports as % total product exports	3.13 (2011) [4.2]
Knowledge-intensive services exports as % total service exports	57.6 (2010) [45.1]
License and patent revenues from abroad as % of GDP	0.58 (20110 [0.58]

An examination of Table 4 indicates that the UK lies above the EU average (1.69) in terms of new doctorate graduates (in 5th position), and has a high proportion of the population that have completed tertiary education. It scores above the EU average (300) in terms of scientific co-publications per million population, lying in 10th position, and is 4th in terms of scientific publications among the top 10% most cited publications worldwide as a percentage of total scientific publications of the country.

R&D expenditure in the public sector totals 0.64% of GDP, compared to an EU-27 figure of 0.74%, while R&D expenditure in the business sector was 1.09% of GDP (compared to 1.26 in the EU-27).

In terms of patent citation share the UK ranks 3rd amongst comparator countries in 2012. In patent applications the UK ranks 6th amongst comparator countries in 2011 and share has increased 0.3% per year in the period 2007-11.

The UK's level of IP income per unit GERD is well above that for Spain and Italy, and is similar to that for Canada and Denmark. The UK had the highest level of IP disclosures per unit GERD in 2011 of the countries with available data, at 0.116 per unit GERD. The UK had the second highest level of start-ups and spin-offs per unit GERD in 2011 of the countries with available data[47]

An overall assessment of the UK's national research and innovation system is provided in Annex 1. In very broad terms, the UK can be considered to perform well against most of the criteria/issues featured in the analysis.

3.2 Structural challenges of the national R&I system

Despite its overall good performance, the national R&I system of the UK still faces a number of challenges, some of which have been in existence for some time. These are:

- Low levels of private sector investment in R&D&I
- Translation of the results of publicly supported R&D into commercial products, processes and services
- Continuing to maintain the capacity of the national system of the science and research infrastructure
- Addressing the future skills needs of industry, particularly in regard to high-end and complementary skills sets
- Continuing to support the specific needs of SMEs, particularly high-growth innovative companies
- Mobilising government resources for procurement in supporting demand-led innovation.

The ongoing low level of private sector investment in R&D&I has been an issue identified by a succession of governments through a series of policy documents. The main instruments addressing it, in terms of size, are the R&D Tax credits for large companies and SMEs. These are accompanied by a range of indirect measures such as awareness promotion, prizes, advisory services, etc. In terms of their appropriateness and impact, the focus on tax credit offers business a demand-led flexible support, which can be used according to the specific needs of each company, rather than a cumbersome and confusing range of targeted measures. In addition, tax credits offer a relatively administratively simple instrument for government and avoid issues such as deadweight, market distortion and the need to balance multi-modal interventions. Against this, they do however remove from government the flexibility to prioritise funding on certain sectors or technologies. These main instruments are supported by range of lower cost flexible services and awareness raiding initiatives which appear to satisfy a number of business support niches.

The challenge of translating the results of publicly supported R&D into commercial products, process and services has led to the development of an extensive range of long-standing

[47] https://www.gov.uk/government/publications/performance-of-the-uk-research-base-international-comparison-2013

measures. To this has been added new cluster-type measures (such as 'Catapults', Knowledge and Innovation Centres and Research and Innovation Campuses) and other incentives, which address a range of actors, through a broad variety of modalities to promote and sustain collaboration for innovation. As might be expected, the complexity of the innovation process which engages a diverse set of actors along its timeline and the periodic assessment of the impact of government interventions has led to the development of a comprehensive set of measures. Evidence suggests that these measures have been successful – indeed the longevity of several of them (albeit subject to some modification) points towards them having received positive appraisals during their lifetime. Examples of relevant new measures would include the funding for the Biomedical Catalyst (and recent announcements of agri-tech and industrial bio-tech catalysts). Moreover, the Research Councils support substantial translational activity including following on funding, IKCs and research and innovation campuses, together with support for university-business collaboration to help ensure the future uptake of research outputs: for example, the launch of the Gateway to Research in 2013 aims to encourage university-business connections.

Efforts towards the maintenance of the science and research infrastructure have largely been achieved through the provision of long-term stable funding streams. Support for the research base has been a priority of a succession of administrations since 1993 when the value of research in underpinning innovation and, hence, the broader economy, was fully recognised. Additional support streams for capital equipment and facilities have also been added to the policy mix, initially to offset the erosion of research infrastructures caused by the structure of HE research and more latterly as a more strategic effort to maintain and support infrastructure for research in key priority areas. The recent ring fenced protection of the research base funding appears to offer a continuing stable platform of support although any significant increases in inflation may erode the real value of research funds in the longer term unless further adjustments are made. Support for large scale research infrastructure has declined with the reduction of the funding via the Large Facilities Capital Fund and Research Capital Investment Fund, although this has been offset somewhat by the new Research Partnership Investment Fund. Thus, despite cutbacks in other government areas, support for research and innovation seems to be holding despite the continuing series of economic uncertainties.

In terms of ensuring the future supply of HRST, there has been continuing support for research training (through the Research Councils) although universities have seen significant cutbacks in their funding for teaching activities. The shortfall was supposed to be addressed by the increase of the cap on student fees that HEIs could charge, although the full effects of these changes are as yet unclear (early indications are that there may be a real and sustained decline in the uptake of university places). However, the Government announced in its 2013 Autumn Statement that the cap was to be removed. To some extent prompted by continuing calls for skilled graduates from employers, there has been some increased attention on workplace skills initiatives and reform of the FE sector plus the establishment of University Technical Colleges for students aged 14-19 that combine practical and academic studies. Some might argue that further structural change is required and that the emphasis placed on the HE sector as the leading supplier of skilled manpower is inappropriate, since the lack of a strong vocational/technical training sector remains an issue. However, recent FE reforms and additional support for FE teaching facilities may be a step towards addressing some of the problems.

Support for SME growth is a further challenge in the UK. The specific tax credits scheme for SMEs provides a major focus of policy support and this is reinforced by a range of more tailored schemes of R&D support which address the specific needs of SMEs. There has also been an increase of policy attention on a range of schemes aimed at mobilising financial support and investment – more recently, these schemes have received even greater attention in response to

the need to protect newly created and developing small companies from the effects of the credit crunch. Measures aimed at the creation of start-ups and spin-offs also exist under the broad challenge of increasing the transfer of research results into economic outputs. Overall, SME support is delivered through a multimodal and flexible range of support measures addressing the spectrum of SME needs at both national and targeted regional/local levels.

Finally, the challenge of mobilising the significant resources invested by government in the procurement of (high tech) goods and services continues to focus policy attention on the issue of public procurement in support of innovation and demand led innovation. There are a limited number of schemes, the most significant being the Government-wide SBRI, although some also exist at departmental level – notably in the NHS. The topic continues to attract significant policy debate and there are policy efforts in place to raise activity in this area. Some evidence of success exists at the level of specific projects, e.g. in NHS run schemes but the main aim is (or should be) to induce behavioural change in government procurement practice at the local level rather than through flagship national level procurement initiatives concerning major infrastructures.

3.3 Meeting structural challenges

Table 5: United Kingdom: key structural challenges, policy measures and their assessment.

Challenges	Policy measures/actions[48]	Assessment in terms of appropriateness, efficiency and effectiveness
low level of private sector investment in R&D&I	- R&D Tax credits: modification to SME R&D Tax credit	- apparently popular measure (c£1.5bn of tax relief related to over €13bn worth of projects in 2010/11)[49]
translation of the results of publicly supported R&D into commercial products, process and services	- national network of Catapults (£240m between 2011-15)	- measure based on thorough review (Hauser, 2010). Too early to assess efficiency or effectiveness – seven now operational
	- investment of €58m in graphene research hub, €24m in satellite-based sensing services and €209m in to life sciences commercialisation - NIHR Translational Research Partnerships - increased investment in NIHR Biomedical Research Centres/Units	- based on strategic reviews and designed to capitalise on UK research strengths. Too early to assess.
	- Collaborative R&D (€174m in 2011-12)	- existing measure. Evidence suggests well used and effective.
	- Knowledge Transfer Networks (KTNs): (€17.5m in 2011-12) (new Special Interest Groups in priority areas)	- supports 15 KTNs with over 38,000 members through the Connect web platform. Apparently well-used and successful measure.
	- Knowledge Transfer Partnerships (KTPs) (€29m in 2011-12)	- over 1,000 live projects per year – apparently popular and successful longstanding measure. Positively evaluated several times
	- Innovation and Knowledge Centres	- focus on business exploitation of emerging research and technology fields
	- Higher Education Innovation Fund (€174m	- good uptake, recently revised allocation process.

[48] Changes in the legislation and other initiatives not necessarily related with funding are also included.
[49] Research and Development Tax Credit Statistics, HMRC August 2013. Available at: http://www.hmrc.gov.uk/statistics/research-tc/rd-introduction.pdf

	per year from 2011-15) – extra €7m input 2012	
	- range of IP support services (launch of Fast Forward (€915,000) and other new initiatives) - Lambert Toolkit	- addresses potential barriers to commercialisation through improved IP awareness and advice - Recently reviewed by IPO
	- introduction of EU VAT cost-sharing exemption, to avoid VAT costs and encourage university/charity cooperation	- new measure, based on N8 review of cost sharing measures
maintenance of research infrastructure	- UK Research Partnership Investment Fund: budget raised to €336m	- number of partnerships already in place
	- protection of the science budget 2010-2015 (€23b)	- appropriate measure given financial climate; efficient use of resources given need to maintain system stability; indicators (publications, researchers, etc.) seem to indicate effectiveness.
	- additional €575m of capital investment since 2010: Large Facilities Capital Fund; Research Capital Investment Fund; HEFCE Research Capital allocation	- measures are appropriate; efficiency and effectiveness are ensured through strategic Large Facilities Roadmap which prioritises needs
	- tax breaks worth €174m over 4 years for research & innovation campuses in local Enterprise Zones	- regional measure aimed at improving performance of centres of excellence for business-research innovation activities
ensure future supply of HRST	- existing range of research training through Research Councils (incl. CASE awards), move towards delivery through teaching/research clusters and centres of excellence	- addresses both generic and more specific employee skills needs. There is still demand from employers for additional skills sets.
	- continuing review of training and teaching needs addressed by HE funding bodies and research councils	- ensures delivery of appropriately trained researchers into the research base and business
	- support for early career post-doctoral research and career development fellowships through Royal Societies, Research Councils and British Academy	- support for excellent researchers, addresses need to maintain quality as lynch pin of research support
	- increased support for Apprenticeships schemes in 2011 – no mention in 2012 Annual Innovation Report	- addresses absence of adequate pathway for lower level technical skills provision – skills addressed at several levels - Richard Review of Apprenticeships published Nov 2012 – Government to took up number of recommendations in Spring, 2013
	- planned reforms to FE system plus facilities funding; introduction of UTCs; proposed sector led FE guild	- not clear, but followed
	- Wilson review of university-business links - Perkins review of Engineering Skills - Witty review of universities and growth	- reports on measures to improve relevance of university training to business needs - published November 2013 - published October 2013
support for SME growth	- R&D Tax credits: increased rate to 225% for SMEs	- based on recent assessment of tax credit; effective and efficient measure
	- Grant for R&D relaunched as /Smart (budget doubled to €48m in 2012)	- long-standing measure – addresses finance market failure, positively evaluated.
	- Business Coaching For Growth - Manufacturing Advisory Service - Business Link - GrowthAccelerator	- advisory services: add further dimension to increase absorptive capacity.

	- OpentoExport	
	- Grant for Business Investment wound down	- oversubscribed – rationale for closure unsure – move criticised
	- Enterprise Capital Funds programme increased by €232m -UK Innovation Investment Fund - Enterprise Finance Guarantee - Venture Capital Trusts	- addresses decrease in availability of VC due to credit crunch. Too early to assess. - positive review in 2012 - lending hit record low in late 2012 – requires increased uptake/effectiveness - in October 2012, amount of money invested in VCTs fell for first time since start of credit crisis as investors switched to Enterprise Investment Schemes.
	- Business Angel Co-Investment Fund (€58m)	- supports UK business angels market against economic downturn. Figures suggest co-investment has declined possibly due to downturn
	- reformed investor tax reliefs including Enterprise Investment Scheme and new Seed Enterprise Investment Scheme	- stimulates investment support in financial downturn. Too early to assess effects.
	- encouraged five main banks to set up a Business Growth Fund of €2.9b to fund high growth companies	- addresses lack of supply of bank capital support for small companies engendered by credit crunch. Too early to assess uptake although 2012/13 review[50] suggests modest increase of uptake since previous year
	- Leveraging of ERDF funding for innovation - awareness raising on Smart Specialisation	- channels ERDF support to regional needs through existing measures
	- new innovation voucher scheme launched (agri-food and built environment)	- based on regional pilots, will focus on sector with low levels of private sector innovation and growth
	- extension of Launchpad: TSB investment to help small businesses finance developing products or services and to leverage in private sector finance. Designed to strengthen clusters through facilitating cooperation and networking	- tailored to specific local needs. Early examples appear to be successful.
support for public procurement and demand led innovation	Small Business Research Initiative (€5.8m in 2011-2012)	Appropriate to policy goals of investigating potential of demand led innovation from Government. Some examples of success.
	Innovation Platforms (€243m)	Address sectoral demand issues (linked to societal challenge areas) through collaborative activities; strong connection to KTNs
	BIS is exploring options for a new Centre of Expertise to provide expert advice on the development of innovation to the public sector	Too early to assess
	Package of measures to standardise procurement, etc. with NHS	Too early to assess

[50] Branching out. How Growth Capital can seed success. Review 2012/13. Available at: http://www.businessgrowthfund.co.uk/wp-content/uploads/2013/07/Review-2013.pdf

4 NATIONAL PROGRESS IN INNOVATION UNION KEY POLICY ACTIONS

4.1 Strengthening the knowledge base and reducing fragmentation

4.1.1 Promoting excellence in education and skills development

Researchers comprise 1.67% of the UK's total active population (Eurostat, 2010 figures), compared to 1.53% of the EU-27 (Eurostat, 2009 figures). The UK research base is very open and has been visibly successful in attracting researchers from both EU and other countries. For example, 13% of those studying at doctoral level in the UK are from EU Member States and 29% are from other countries (2010 figures). There are also significant numbers of early career researchers, academic post holders and research fellows from other countries. In this context, grant portability is a matter for UK funding agencies in collaboration with their partners elsewhere. The UK Research Councils are all members of the Money Follows Researchers Scheme, which allows researchers relocating to a new country to take with them the remainder of a current research grant to a new research institution where it can continue with the original terms and objectives.

In addition, the UK approach to open appointments, support for career development and other matters recognised as making a research career more attractive generally constitutes best practice. This approach is set out in the UK's Concordat to Support the Career Development of Researchers, which is referenced in the ERA Communication as an example of a Member State transposing the Charter and Code into their national contexts with notable results. The practices and principles espoused by the Research Councils for the recruitment and training of researchers collectively address the full range of the ERA Communication's principles, therefore there are no specific individual measures that address the principles for Innovative Doctoral Training as stipulated by the ERA Communication..

Language barriers tend to be minor: in fact, English language is seen to be an attractant for researchers from overseas. In order both to attract researchers to the UK and encourage UK researchers to make contacts abroad, the UK Government supports the development of the EURAXESS web portal and network as a source of information and services to researchers across Europe and beyond. The British Council, with financial support from BIS, is responsible for the delivery of the UK part of this activity. The UK has reservations about the Commission's intention to develop a European Accreditation Mechanism for the Charter and Code and takes the view that full discussion should be held regarding the relative merits of accreditation versus enhancement-led approaches. However, since the UK has endorsed the principles of the Concordat, along with the QAA Code of Practice for research degrees, the Commission considers this to be equivalent to adopting the European Charter and Code. Moreover, the UK has 89 organisations with the European Commission's HR Excellence in Research Award, which acknowledges their alignment with the principles of the European Charter for Researchers and Code of Conduct for their Recruitment.

The UK is content that discussions concerning Commission action on the open labour market priority to address what are seen as social security barriers for researchers should focus on high

mobility groups as a whole rather than seeking to treat researchers in isolation. On pension arrangements, researchers in the UK have access to private pension arrangements and may transfer their pensions to another pension arrangement abroad, subject to tax requirements.

It is not possible to provide "qualitative expert judgement on the current use of the EURAXESS platform". This would be information held by the operator, the British Council.

4.1.2 Research Infrastructures

The UK is viewed as an example of good practice in terms of its policies towards the accessibility of research infrastructures. The UK Government is continuing to work through ESFRI and directly with the Commission to further realise the opportunities that could arise for the strategic planning and operation of such facilities, including access for non-national researchers, both within and outside Europe.

The UK Government has recognised the importance of providing investment in the appropriate research infrastructures and in the 2013 spending review, pledged to increase the investment in infrastructure capital from £500M p.a. to £1.1B p.a. in 2021. This follows significant investment in recent years in e-infrastructure and in the 8 Great Technologies (Big Data, Space, Robotics, Synthetic biology, Regenerative medicine, Agri-science, Advanced materials and Energy) The UK Research Councils published a capital investment framework in 2012[51], and building on this, the Government is undertaking a consultation with the research community and other stakeholders to identify priorities for investment to 2021. This will include both institutional and regional based infrastructures but also where the UK could collaborate on an international basis, either as a host or part funding a facility based elsewhere.

With regard to the removal of barriers for access to UK research facilities, except in cases that may conflict with interests of national security, access to UK research infrastructures is open to all UK and non-UK nationals who are registered as UK academics (in a UK HEI or Research Council Institute); Postdoctoral researchers from UK universities; those applying via EU transnational access arrangements (the level of access is in accordance with agreed EU funding levels); overseas organisations that have contractual access agreements with the relevant facilities. In addition, applications from overseas (non-EU or without prior contractual access arrangement) will also be considered.

Direct financial support for such access is generally not provided although support from schemes operated by the Royal Society and the Royal Society of Engineering may be sought by non-nationals.

4.2 Getting good ideas to market

4.2.1 Improving access to finance

The UK government has recognised the need to improve access to finance, particularly for small firms. A range of distinct and complementary measures are in place and support is delivered through a multimodal and flexible set of support measures addressing the spectrum of SME

[51] http://www.rcuk.ac.uk/publications/policy/capitalinvestment

needs, which cover all the aspects of SME provision (direct funding, mobilisation of finance, provision of advisory services, etc.) at both national and targeted regional/local levels. Recent developments include the £1bn (c. €1.25bn) confirmed for the business bank to address the long-term structural gap in lending to small businesses; extra funding £140m (€170m) for UK Trade & Investment (UKTI) to help SMEs export abroad and £1.5bn (€1.8bn) to help small companies access growing markets overseas, together with further measures to cut back red tape that acts as a barrier to business growth. More support is provided through the Seed Enterprise Investment Scheme (SEIS), introduced in April 2012 to encourage investment in new small companies while, in the same period the annual investment limit for the Enterprise Investment Scheme (EIS) was raised to £1m (c. €1.25m) for individuals and the gross asset limit, employee limit and investment limit for EIS and the Venture capital Trusts (VCTs) were increased along with some further modifications. The single greatest allocation of innovation support is via the R&D Tax Credits schemes, for large and smaller firms: the SME R&D Tax Credit was modified during 2012, raising the level to 225%. Also in 2012, the TSB launched a new innovation vouchers programme, targeting areas and sectors with relatively low levels of private sector innovation and growth. Vouchers can be used by start-up, micro and SMEs to access up to £5,000 (€6,100) worth of advice and expertise from universities, research organisations or other private sector knowledge suppliers. The Government also provided an additional £200m (€240m) to the Enterprise Capital Funds, which offer finance of up to £2m (€2.4m) investment to SMEs with high growth potential.

In terms of direct support, the former Grant for R&D was relaunched by TSB in December 2012 as Smart, and funding was doubled to £40m (€48m) per year. In order to provide more help to early stage micro companies that have not previously worked with the TSB, linkages to other forms of support are being created such as to the private investment community and to the GrowthAccelerator scheme for coaching and mentoring. Funding to the Designing Demand scheme was increased to £1.3m (€1.6m) over 2012/13 and the scheme was also evaluated (see below). A further £200m was added to the £100m (€122m) funding already provided in the 2012 Budget for the UK Research Partnership Investment Fund (UKRPIF). The Fund assists universities in leveraging co-investment from the private and charity sectors into long-term strategic research partnerships. The scheme, which is managed by the Higher Education Funding Council for England, provides funding for large capital research projects of between £10-35m (€12-42m).

All government support schemes adhere to HM Treasury provisions which ensure that they are evaluated according to strict criteria.

4.2.2 Protect and enhance the value of intellectual property and boosting creativity

The UK's Intellectual Property Office (IPO) is responsible for the intellectual property framework in the UK for patents, trademarks, designs and copyright. An effective and fair intellectual property (IP) framework is essential to support the translation of the results of research into innovative products, processes and services. The IPO's Guide to Intellectual Asset Management for Universities[52] provides guidance on implementation of an IP strategy to optimise the benefits from the intellectual assets created by their staff and students and is

[52] http://www.ipo.gov.uk/ipasset-management.pdf

underpinned by the Commission Recommendation on the management of IP in knowledge transfer activities. The 2013 round of the Fast Forward competition, a £750,000 (€915,000) fund for prizes to projects which improve the management of IP in knowledge exchange and the longstanding Lambert toolkit provide further initiatives to support universities seeking to maximise the benefit of their IP. The Lambert toolkit is intended for universities and companies that wish to undertake collaborative research projects with each other and consists of a set of five Model Research Collaboration (one to one) Agreements four Consortium (multi-party) Agreements. Its aim is to maximise innovation between the public and private sector by encouraging university and industry collaboration and the sharing of knowledge. An evaluation of the toolkit conducted by the IPO demonstrated the toolkit has had a positive effect on university-business collaboration and identified some areas where it could be usefully updated. The IPO has begun work to improve the toolkit to reflect modern legal practices and the increased collaborative nature of these relationships.

Recent business support initiatives include the identification of a number of areas where it can improve business support, including IP Audits Plus, introduced to ensure businesses with high growth potential receive the right advice to develop effective IP strategies to maximise the value of their innovation. The audit, undertaken by a qualified IP Professional, is intended to provide the business with a strategic overview of the IP assets within their business (including registered and unregistered rights) and to assess the viability of the IP management strategies employed by the business. The audit also includes dedicated follow up advice from an IP Professional on a one hour pro bono basis. The IPO also provides IP Masterclass training for business advisors and a range of IP for Business support tools to advise businesses on intellectual property.

4.2.3 Public procurement

The issue of public procurement in support of innovation and demand led innovation continues to form a focus for policy attention. Although there are a limited number of schemes, the most significant being the Government-wide SBRI (Small Business Research Initiative) a number also exist at departmental level – notably in the NHS concerned with the procurement of innovative healthcare solutions. As noted above, in 2012, an expansion of the scheme, which supports SMEs in providing innovative public sector solutions, was announced in June 2013. This will see £100m (c. €125m) channelled through the scheme in 2013-14 and all Government departments will be expected to expand their use of the scheme. Specific targets for key departments for 2013-14 have been set out, including £50m (c. €62.5m) from the Ministry of Defence and $30m (c. €37.5m) from the National Health Service.

The topic continues to attract significant policy debate and there are policy efforts in place to raise activity in this area. Some evidence of success exists at the level of specific projects, e.g. in NHS run schemes but the main aim is (or should be) to induce behavioural change in government procurement practice at the local level rather than through flagship national level procurement initiatives concerning major infrastructures.

4.3 Working in partnership to address societal challenges

The UK is participating in the Active and Healthy Ageing and Raw Materials European Innovation Partnerships (EIPs), with involvement from a number of public bodies, universities and private companies. Information on participants in the other 5 EIPs, Agricultural Productivity and Sustainability, Smart Cities and Communities and Water is apparently

unavailable via Cordis, although an individual search on each reveals details such as the fact that, for example, the London Assembly is a member of the high level group for Smart Cities.

The UK is participating in all ten JPIs and is taking a lead role in at least three of these: the UK is leading one of four successful projects in the JPND's first joint call; the UK is jointly leading the Agriculture, Food Security and Climate Change JPI which has recently established a Knowledge Hub to integrate models of climate change; and the UK has developed the Heritage Portal for the Cultural heritage JPI.

Several of the key Grand Challenges issues are also mirrored in the UK's cross-Research Council research programmes which are coordinated by Research Councils UK, the strategic partnership of the Research Councils working together. Each cross-Council programme is led by one of the UK Research Councils.

These are: Energy; Living with environmental change (LWEC); Global uncertainties: security for all in a changing world; Ageing: Lifelong health and wellbeing; Digital economy; Global food security[53].

It is recognised that evaluation is included as an essential component in the EC Guidelines on Framework Conditions for JPIs. Thus, while a common ex-post evaluation of the whole programme may be appropriate at the EC level, individual JPIs will be monitoring their own progress. The precise mechanism may vary as befits the different grand challenge themes, their communities, structures and ambitions.

4.4 Maximising social and territorial cohesion

As noted in Section 2.7, there is not an explicit national Smart Specialisation Strategy, although the UK Government recognises the concept of Smart Specialisation (and has espoused its main principles for a number of years prior to the adoption of the smart specialisation label) and fully supports local and regional initiatives towards the development of local strategies.

4.5 International Scientific Cooperation

In the broader area of collaboration with third countries, the UK Government welcomes the intention to increase the impact of the JPIs by serving as a platform for international participation with partner countries outside Europe. Early discussions with third country partners are already underway. It is also recognised that work is underway at a global level, and based on recent policy activity between European research funding and performing organisations, to develop a set of commonly agreed criteria for peer review. Some high level principles were signed off at the first meeting of the new Global Research Council policy forum in May 2012.

Numerous initiatives are also in place within a range of research organisations, particularly the Research Councils. A non-exhaustive list would include the references noted in the footnote below[54].

[53] http://www.rcuk.ac.uk/research/xrcprogrammes/

[54] http://www.rcuk.ac.uk/international/offices/
http://www.esrc.ac.uk/funding-and-guidance/funding-opportunities/28130/two-way-sbe-rcuk-lead-agency-agreement.aspx

However, the UK is already viewed as a very open economy and already attracts large numbers of researchers from across the world, including the USA, indeed for the years between 2003-07, an average of 30.3% of all UK co-authored papers were with a US author, in 2008 this figure had to 30.5%, a proportionate increase of +1.01% (Evidence Ltd, 2009). Thus, the notion of needing to 'redress' transatlantic mobility, whilst identified as an issue in the early 1960s, is not a current policy concern. In a general sense, the attractiveness of the UK's research and innovation base to scientific and technological talent from around the world is reflected in one of the main objectives of the Governments Innovation and Research Strategy for Growth for the maintenance of the UK's research base.

http://www.rcuk.ac.uk/international/funding/collaboration/rcukfapespmou/
http://www.rcuk.ac.uk/international/funding/collaboration/g8initiative/

5 NATIONAL PROGRESS TOWARDS REALISATION OF ERA

5.1 More effective national research systems

A clear strategy for innovation and research is in place and is assessed on an annual basis against agreed milestones (BIS, Innovation and Research Strategy for Growth, December 2011).

The Department for Business, Innovation and Skills (BIS) plays the lead executive role in research issues, and is the major provider of research funds for the public sector. This provides funds for the seven Research Councils, each organised on a broad disciplinary basis, which in turn support R&D both in Higher Education Institutes (HEIs) , independent research organisations and in their own institutes. Thus, BIS has oversight for the majority of R&D policy formulation, and forms the main author of strategic policies for R&D and innovation, while the Research Councils will develop their specific R&D policies.Funding for private sector R&D, either in the form of direct grants or via measure intended to stimulate public/private collaboration in R&D is allocated via the Technology Strategy Board which also falls under the oversight of BIS.

Government funding for research is allocated via a process that is firmly based on open calls for proposals with independent evaluation and peer review using national and international reviewers. Again, all mechanisms are efficiently and regularly implemented – indeed the UK represents a leading exponent for the application of evaluation and assessment practice.

Both Research Council Institutes and Higher Education Institutes are subject to regular independent review, the results of which impact on the funding allocated to these institutions. Research councils are subject to a process of triennial review, while Government PSREs are subject to triennial reviews. The RAE (now REF) is a four-yearly assessment exercise of HEI units of assessment used to inform the allocation of university block funding for research.

5.2 Optimal transnational co-operation and competition

The UK is an active and leading participant in several EC initiatives aimed at grand challenges issues, including Joint Programming Initiatives (JPIs). These align closely to national programmes which address grand challenge issues and which are operated by the UK Research Councils, although the latter are more fully tailored to the national research capability and to priority UK concerns.

As in all areas of publicly funded research, arrangements for evaluation are fully embedded and are compatible with international best practices.

The UK government is also participating in discussions towards increasing the participation in European initiatives of third countries and in evolving mechanisms for the interoperability of third country participation in national programmes.

In addition, the UK is closely involved in discussions concerning the ESFRI and a number of planned UK initiatives feature in the ESFRI roadmap as items for mutual cooperation or as potential locations for participation by UK researchers.

Overall, subject to funding availability, access to most UK research infrastructures is open to non-UK nationals not resident in the UK subject to successful Peer Review.

5.3 An open labour market for researchers

The UK research base is very open and has been visibly successful in attracting researchers from both EU and other countries. For example, 13% of those studying at doctoral level in the UK are from EU Member States and 29% are from other countries. There are also significant numbers of early career researchers, academic post holders and research fellows from other countries. In addition, the UK approach to open appointments, support for career development and other matters recognised as making a research career more attractive generally constitutes best practice. This approach is set out in the UK's Concordat to Support the Career Development of Researchers, which is referenced in the ERA Communication as an example of a Member State transposing the Charter and Code into their national contexts with notable results.

UK funding agencies adhere to the Money Follows Researchers Scheme and are engaged in discussions with partner organisations regarding grant portability.

The UK is an active participant in and user of the EURAXESS Portal and services. It is not possible to provide "qualitative expert judgement on the current use of the EURAXESS platform". This would be information held by the operator, the British Council.

The UK sees itself as extremely well placed with regard to best practice of the principles for Innovative Doctoral Training. The practices and principles espoused by the Research Councils for the recruitment and training of researchers collectively address the full range of the ERA Communication's principles, hence there are no specific individual measures that address the principles for Innovative Doctoral Training as stipulated by the ERA Communication.

The EC's Charter for Researchers and Code of Conduct for the Recruitment of Researchers were broadly based on the 1996 UK Concordat. When this was revised in 2008, its principles were mapped on to those of the EC Charter and Code. The Commission considers that, by endorsing the principles of the Concordat together with the QAA Code of Practice for Research Degrees, this is equivalent to adopting the European Charter and Code. Moreover, the UK has 89 organisations with the European Commission's HR Excellence in Research Award, which acknowledges their alignment with the principles of the European Charter for Researchers and Code of Conduct for their Recruitment.

5.4 Gender equality and gender mainstreaming in research

The UK has a clear legal framework on equality in place. Gender equality is enshrined in the Equality Act 2010 which provides a legislative framework to advance equality of opportunity for all. The Children and Families Bill, which will be introduced in 2014, will create a system of flexible parental leave. The Public Sector Equality Duty places a responsibility on public bodies, including universities and research councils, to consider gender issues in shaping policies, delivering services and employing staff.

In addition, UK Funding Councils are committed to supporting and promoting equality and diversity in research careers. The Research Excellence Framework (REF) which assesses the quality of research in UK higher education institutions was developed taking account of equality issues and a REF Equality and Diversity Panel has been established to advise on implementing the REF diversity and equality measures.

The Royal Society and the Royal Academy of Engineering are jointly leading a programme to tackle the long-standing issue of diversity in science, technology, engineering and maths (STEM). Many of the Government's other STEM partners are also contributing directly to the equality and diversity agenda; for example, the work of the National Academies and their academic fellowships; RCUK's PhD and fellowship awards; and STEMNET and STEM Ambassadors. In addition, the Athena SWAN Charter recognises good employment practice for women working in science, engineering and technology in higher education and research.

One of the key principles of the Concordat to Support Career Development of Researchers is that diversity and equality must be promoted in all aspects of the recruitment and careers management of researchers. RCUK is leading cultural change in the HE sector; their ambition is to: ensure that the best researchers from a diverse population are attracted to research careers; enhance the quality of research training and employability of early career researchers; and enhance the impact of UK researchers by promoting improved career development and management of research staff by research organisations. For example, the National Institute for Health Research has mandated Athena SWAN Silver accreditation for funding for Biomedical Research Centres and Units and RCUK has set out a Statement of Expectations for Equality and Diversity to improve progress in this area

RCUK has reported that around 25% of research councils' funding panels are women. It sees a 40% target as challenging for the UK, even though it may have a better record than other countries. It suggests that the recommendation from the Commission's Expert Group on the Research Profession 2012 would be more appropriate; "Member States and employing institutions are urged to reflect on their current practices to ensure that selection committees are representative of the population they serve and remember that women now out-number men amongst graduates".

5.5 Optimal circulation, access to and transfer of scientific knowledge including via digital ERA

Regarding Open Access (OA), the UK Government announced in July 2012 that publicly funded scientific research should be made available for anyone to read for free, by accepting the key recommendations (with one exception[55]) in the Finch Group's independent report on OA – 'Accessibility, sustainability, excellence: how to expand access to research publications' (published in June 2012)[56]. The report concluded that the most effective way to deliver OA was through the 'gold' open access model in which Article processing Charges (APCs) are paid upfront to cover the costs of publication.

Concerning the preservation of scientific information, the UK is at the forefront of advancing this topic within Europe. The UK Research Councils have already invested in a number of

[55] The only recommendation rejected by Government concerns removal of VAT on electronic research publications; we are bound by European Union regulations and therefore unable to remove the VAT.
[56] http://www.researchinfonet.org/wp-content/uploads/2012/06/Finch-Group-report-FINAL-VERSION.pdf

successful repositories. Notable examples include the Economic and Social Research Council's Research Catalogue which has been funded by the Medical Research Council, the Biotechnology and Biological Sciences Research Council, the Chief Scientist's Office, part of the Scottish Government Health and Social Care Directorates and other funding bodies.

The UK Government agrees that support for OA publication should be accompanied by policies to minimise restrictions on the rights of use and re-use, especially for non-commercial purposes, and on the ability to use the latest tools and services to organise and manipulate text and other content. Where Research Council funds are used to pay the APC for an Open Access paper (Gold OA), the publisher must make the paper freely available under a Creative Commons Attribution (CC-BY) licence. A CC-BY licence supports the maximum dissemination and re-use of published papers, whilst protecting the moral rights of authors. Where funds are not available for Gold APCs the UK allows embargo periods for Green OA to be twice those permitted by the Commission (with the exception of biomedical research which remains at 6 months).

The UK Government has, for a number of years, been highly active in knowledge transfer. The UK Government position is encapsulated in BIS Economics paper No 15, in which it is noted: "innovating firms must be porous to their environment… they must collaborate, network, monitor their environment and interact with individuals, firms and other organisations as they seek to assemble the knowledge that underpins innovation".

The Technology Strategy Board, the UK's principal innovation agency, facilitates networking to enable knowledge transfer through a variety of mechanisms, for example TSB direct communications, TSB technologists, EU FP7 national contact points (NCPs), and Knowledge Transfer Networks (KTNs). [The UK Research Councils also provided FP7 NCPs and will continue to do so in Horizon 2020].Other TSB mechanisms to promote knowledge transfer include Knowledge Transfer Partnerships, Grants for Collaborative Research and Development and Innovation Vouchers. At the same time, the Research Councils operate Cooperative Awards for Science and Engineering which promote jointly supervised studentships between academic and private or other public sector actors.

Both the UK Research Councils and British industry recognise the importance of digital infrastructures and the positive impact they may have on the economy and on employment. The UK has published a Strategic Vision for UK e-Infrastructure and is in the process of investing £165m (c€200m) to strengthen the UK's e-infrastructure in collaboration with industry.

The UK Government is exploring the implications of electronic identity for researchers. The Joint Infrastructure Systems Committee (JISC) representing UK universities has recently led a project in collaboration with UK research stakeholder to investigate the best way to promote unique identifiers for researchers, and therefore have a better way of tracking their contribution and career paths. The project outcomes recommended the adoption of the Open Researcher and Contributor Identifier (ORCID), which currently offers the best sustainable solution. The implementation of such system does raise a number of challenges, such as identity validation and identity tracking, as well as protection of personal data, but a number of UK universities have perceived the benefits to outweigh the issues, and have already adopted ORCID, which has received the support of the Higher Education Statistics Agency.

ANNEX 1. PERFORMANCE THE NATIONAL AND REGIONAL RESEARCH AND INNOVATION SYSTEM

Feature	Assessment	Latest developments
1. Importance of the research and innovation policy	(+) R&I is considered as a key policy instrument for growth, employment and social/economic well-being (+) A central lead policy department is in place, closely linked to the relevant research and innovation executive stakeholders. (+) Policies addressing major societal challenges are implemented at a range of levels, many integrating R&I concerns and issues.	BIS review of international. comparative evidence on performance of UK's S&I system (reported early 2014[57])
2. Design and implementation of research and innovation policies	(+) A strategic framework for R&I exists and is fully implemented at national level (+) Policy making is fully informed and integrated at a range of levels and is informed by active and long-established processes of review and evaluation.	*Future of manufacturing: a new era of opportunity and challenge for the UK* – (Foresight project report)[58]
3. Innovation policy	(+) For several years innovation policy has been pursued in its broadest sense encompassing RDTI policies and other policy fields (energy, health, environment, industry, employment, education, etc.) (+) Both supply and demand sides receive sufficient policy attention, although policy interest in the demand side is a more recent development.	None
4. Intensity and predictability of the public investment in research and innovation	(+) In common with all Government spending plans which adhere to a four-year Comprehensive Spending Review cycle, the government's Innovation and Research Strategy for Growth sits within a multi-year budget of investment. (+) A number of innovation support measures seek to leverage additional private sector support, ranging from collaboration schemes, through venture capital provision to R&D tax credit and PPI schemes.	Minor changes to Enterprise Investment Scheme
5. Excellence as a key criterion for research and education policy	(+) Research funding via the Research Councils is allocated on a competitive basis and follows international good practice with regard to peer review. Similarly, block grant allocations to HEIS for research activities are also allocated on the basis of an international peer review mechanism. (+) Grant awards to individuals and institutes are subject to evaluation processes to ensure quality and conformity. (+) the Research Councils adhere to the Money Follows Researcher procedures. (+) UK HEIs are fully autonomous, self-governing bodies which operate open recruitment methods. (+) UK HEIs attract a broad range of revenue sources including public, European, international, private sector and philanthropic (PNP and charitable) funding.	None

[57] https://www.gov.uk/government/publications/performance-of-the-uk-research-base-international-comparison-2013

[58] *Future of manufacturing: a new era of opportunity and challenge for the UK.* (Foresight project report). BIS, October 2013. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/255923/13-810-future-manufacturing-summary-report.pdf

	(+) UK employment conditions must follow the provisions of the Equal Opportunities legislation.	
6. Education and training systems	(-) UK scores comparatively poorly on in terms of international standards with regard to STEM skills, particularly at pre-tertiary level. (+) Evidence that skills needs of industry (especially high-level) are still failing to be met. (+) Number of recent reviews of skills needs and their supply, with appropriate recommendations for action (+) Recent policy focus on apprenticeships. (+) Tertiary education curricula increasingly focus on provision of training for complementary skills.	Perkins review on Engineering Skills[59]
7. Partnerships between higher education institutes, research centres and businesses, at regional, national and international level	(+) A large range of measures is in place to encourage knowledge and investment flows between the public and private sectors at all levels. (+) Clear rules and guidelines in place for the treatment of IP. (+) Government is fully supportive and encourages transnational partnerships ands collaborations.	Witty Review on Universities and Growth[60]
8. Framework conditions promote business investment in R&D, entrepreneurship and innovation	(+) Oversight of R&D, entrepreneurship and innovation policies rests in single department (BIS) which ats in close concert with other relevant policy bodies (e.g. HM Treasury, HMRC). (+) Several measures address supply of venture capital provision. (+) Ongoing programme of simplification of Government services for business administration and regulation. (+) Balanced system for the provision of advice and help on insolvency and protection of consumers against fraudulent behaviour with regards to insolvency and bankruptcy. (+) Robust IP and standards regime.	Further simplification of business regulation (especially for SMEs).
9. Public support to research and innovation in businesses is simple, easy to access, and high quality	(+) Complementary portfolio of business support products delivered through appropriate channels. (+) Process of routine evaluation and assessment is HMT condition for the allocation of departmental budgets. (+) Ongoing programme of simplification of Government services for business administration and regulation. (+) Support is provided for business internationalisation (especially for SMEs).	Further simplification of business regulation (especially for SMEs). 2012 budget announced extra funding (€170m) for UKTI to help SMEs export abroad; and €1.8b to help small companies access growing markets overseas.
10. The public sector itself is a driver of innovation	(+) Formerly centralised initiatives on public innovation and its dissemination now rolled out to local level. Public sector innovation still receives high policy attention. (+) Guidance has been issued by BIS to all Departments for innovative public procurement. (+) Various aspects of demand led innovation and the government's potential role form a topic of policy focus.	Package of measures introduced to standardise procurement practice, etc. with NHS.

[59] *Professor John Perkins' review of engineering skills*, BIS, November 2013. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/254885/bis-13-1269-professor-john-perkins-review-of-engineering-skills.pdf

[60] Encouraging a British Invention Revolution: Sir Andrew Witty's Review of Universities and Growth, October 2013. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/249720/bis-13-1241-encouraging-a-british-invention-revolution-andrew-witty-review-R1.pdf

ANNEX 2. NATIONAL PROGRESS ON INNOVATION UNION COMMITMENTS

		Main changes	Brief assessment of progress / achievements
1	**Member State Strategies for Researchers' Training and Employment Conditions**	no recent changes	(+)Introduced Concordat to Support the Career Development of Researchers (+)UK Research Councils members of Money Follows Researchers Scheme
4	**ERA Framework**		
5	**Priority European Research Infrastructures**	no new measures	(+) UK access to RI viewed as European good practice. (+) UK RI are fully open to non-nationals on merit
7	**SME Involvement**	Innovation vouchers scheme expanded Extra support from KTI for SMEs to access export markets	(+) UK encourages participation of UK SMEs in all EC initiatives (e.g. FP, JEREMIE)
11	**Venture Capital Funds**	Modification to Venture Capital Trust allowances	(+) VCTs and Business Angel support is well-provided. (+) several forms of "access to finance" support.
13	**Review of the State Aid Framework**	no recent changes	(+) Range of government departments provide advice on state aid regulations.
14	**EU Patent**	UK signed ratification in Feb 2013.	(+) UK is signatory, Court is based in London
15	**Screening of Regulatory Framework**	new policy measure introduced (one-in, two out).	(+) 'One in, Two out'. (+) Red tape challenge.
17	**Public Procurement**	Increase to SBRI budget. BIS exploring options for Centre of Expertise to provide advice on development of innovation to public sector.	(+) SBRI includes targets for Departmental procurement. (+) innovation seen as central pillar for procurement.
20	**Open Access**	RCs and HEFCE support for OA publishing. Government take up of Finch Review of OA recomms. Support for universities for transition to OA. Open Data White Paper published June 2012. Data Strategy Board established. Planned Open Data Institute.	(+) Full government policy and funding support for transition to OA regime. (+) Assessment of electronic researcher identity system ongoing.

21	**Knowledge Transfer**	Launch of Fast Forward and other new IP initiatives. Evaluation of Lambert toolkit New catapult centres launched. New Innovation & Knowledge Centres. TSB Launchpad extended. Wilson Review of business-university links.	(+) full guidance and IP protection measures in place. (+) KT arrangements are generally left to case by case basis by those involved – no one size fits all framework. (+) numerous, long-standing KT schemes in place. (-) mismatch between university block funding for research criteria and incentives for business engagement. (+) several information access and advisory schemes in place.
22	**European Knowledge Market for Patents and Licensing**		(+) full guidance and IP protection measures in place. (+) range of support and advisory services from UK IPO.
23	**Safeguarding Intellectual Property Rights**	Memorandum of Understanding between UK IPO and Competition and Markets Authority	(+) full guidance and IP protection measures in place.
24	**Structural Funds and Smart Specialisation**	New criteria and guidance for LEP applications for SIF. Government consultation on identification of economic priorities for LEPS.	(+) UK-wide guidance on smart specialisation strategies development. (+) most principles of smart specialisation already adopted.
25	**Post 2013 Structural Fund Programmes**	Still under review and negotiation	
26	**European Social Innovation pilot**	New schemes: Big Society Capital, Social Action Fund.	(+) Has attracted significant policy interest. (-) UK initiatives still require development and are fragmented
27	**Public Sector Innovation**	Measured as part of NESTA Innovation Index – ongoing work.	(+) significant activity at local public sector level, including awards and prizes. (+) central government progress now disseminated to local level.
29	**European Innovation Partnerships**	Presence in at least 2 EIPs.	Too early to say.
30	**Integrated Policies to Attract the Best Researchers**		(+) UK already major destination of leading researchers. (+) UK has open policy towards third country researchers.
31	**Scientific Cooperation with Third Countries**	No recent changes since introduction of Tier system, except modifications to improve access (October 2013)	(+) UK well integrated in international fora. (+) range of schemes to encourage transnational collaboration and mobility. (-) some public concerns over level of general immigration.
32	**Global Research Infrastructures**		(+) fully integrated in many international agreements, including ESFRI.
33	**National Reform Programmes**	no major change	(+) few specific R&I actions are relevant to the NRP due to UK standard of good practice.

ANNEX 3. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

ERA Priority	ERA Action code	ERA Action	Recent changes	Assessment of progress in delivering ERA
ERA priority 1: More effective national research systems	**MS01**	Action 1: Introduce or enhance competitive funding through calls for proposals and institutional assessments	New REF assessment process being implemented.	(+) Competitive mode and institutional block funding systems fully in place for several years.
	MS02	Action 2: Ensure that all public bodies responsible for allocating research funds apply the core principles of international peer review	No recent changes.	(+) International peer review principles are firmly embedded in all UK allocation mechanisms.
ERA priority 2: Optimal transnational co-operation and competition	**MS06**	Action 1: Step up efforts to implement joint research agendas addressing grand challenges, sharing information about activities in agreed priority areas, ensuring that adequate national funding is committed and strategically aligned at European level in these areas	No recent changes.	(+) UK participates in several JPIs and in new EIPs. (+) Cross-Research Council programmes on grand/social challenges.
	MS07	Action 2: Ensure mutual recognition of evaluations that conform to international peer-review standards as a basis for national funding decisions	No recent changes.	(+) International peer review and best practice fully integrated into the evaluation and assessment systems and processes operated by UK funding agencies, including those in the not-for-profit sector.
	MS08	Action 3: Remove legal and other barriers to the cross-border interoperability of national programmes to permit joint financing of actions including cooperation with non-EU countries where relevant	Agreement on high level principles by new Global Research Council policy forum (May 2012). RCUK working with Science Europe to improve evidence base for perceived barriers to cross-border interoperability.	(+) Discussions and investigations of barriers to inter-operability ongoing. (+) UK Research Councils operate Money Follows Researchers Scheme. (-) Reservations to full interoperability exist.
	MS15	Action 4: Confirm financial commitments for the construction and operation of ESFRI, global, national and regional RIs of pan-European interest, particularly when developing national roadmaps and the next SF programmes	No new developments.	(+) UK participates in several ESFRI activities – UK regarded as good practice example. (+) Large Facilities Capital Fund targets RIs. (+) UK has produced Large Facilities Roadmap which is subject to periodic renewal and which exhibits several links to ESFRI

				road map.
	MS16	Action 5: Remove legal and other barriers to cross-border access to RIs	No recent changes.	(+) access to UK RIs open to all UK and non-UK (including non-EU) nationals according to set criteria.
ERA priority 3: An open labour market for researchers	**MS24**	Action 1: Remove legal and other barriers to the application of open, transparent and merit based recruitment of researchers	No recent changes, except amendments to skilled worker immigration conditions	(+) UK research base is very open and successful in attracting researchers from both EU and other countries. (+) Recent figures show upsurge in projected overseas student numbers in UK universities
	MS25	Action 2: Remove legal and other barriers which hamper cross-border access to and portability of national grants	No new developments	(+) UK Research Councils operate Money Follows Researchers Scheme.
	MS26	Action 3: Support implementation of the Declaration of Commitment to provide coordinated personalised information and services to researchers through the pan-European EURAXESS3 network	No new developments	UK Government supports development of EURAXESS web portal (hosted by the British Council) and network as a source of information and services to researchers across Europe and beyond.
	MS27	Action 4: Support the setting up and running of structured innovative doctoral training programmes applying the Principles for Innovative Doctoral Training.	No new developments	(+) UK extremely well-placed with regard to Innovative Doctoral Training: UK examples highlighted in a Commission feasibility study.
	MS28	Action 5: Create an enabling framework for the implementation of the HR Strategy for Researchers incorporating the Charter & Code	No new developments	(+) UK's endorsement of the principles of the Concordat for Researchers and the QAA Code of Practice for research degrees is considered to be equivalent to adopting the European Charter and Code. UK has 89 organisations with the EC's HR Excellence in Research Award, which acknowledges their alignment with the principles of the European Charter for Researchers and Code of Conduct for their Recruitment.
ERA priority 4: Gender equality and gender mainstreaming in research	**MS39**	Action 1: Create a legal and policy environment and provide incentives	Children & Families Bill proceeding through Parliament (relevance relates to equality of parental leave requirements)	(+) UK has legal framework on equality in place (Equality Act 2010), whilst a number of responsibilities, good practice guides and voluntary frameworks on gender equality and diversity issues operate at various levels through the research system.
	MS40	Action 2: Engage in partnerships with funding agencies, research organisations and universities to foster cultural and institutional change	The NIHR has mandated Athena SWAN Silver accreditation for	(+) numerous initiatives in place to support the equality and diversity agenda. (+) Specific examples: STEMNET, Athena Swan Charter; Concordat

		on gender	funding for Biomed. Research Centres and Units and RCUK has set out a Statement of Expectations for Equality and Diversity to improve progress in this area.	to Support Career Development of Researchers
	MS41	Action 3: Ensure that at least 40% of the under-represented sex participate in committees involved in recruitment/career progression and in establishing and evaluating	No recent developments	(+) RCUK endorses view of Commission's Expert Group on the Research Profession 2012 "to reflect on their current practices to ensure that selection committees are representative of the population they serve".
ERA priority 5: Optimal circulation, access to and transfer of scientific knowledge including via digital ERA	**MS45**	Action 1: Define and coordinate their policies on access to and preservation of scientific information	Government has endorsed recommendations of Finch Report on OA	(+) UK to follow gold access. (+) UK Research Councils operate several research repositories.
	MS46	Action 2: Ensure that public research contributes to Open Innovation and foster knowledge transfer between public and private sectors through national knowledge transfer strategies	New Catapult Centres and other KT initiatives extended	(+) UK has extensive track record of initiatives designed to foster OI and KT between public and private sectors.
	MS47	Action 3: Harmonise access and usage policies for research and education-related public e-infrastructures and for associated digital research services enabling consortia of different types of public and private partners	Following recommendation of 'A strategic vision for e-infrastructure', Government has set up E-infrastructure Leadership Council (ELC) to advise on all aspects of e-infrastructure including networks, data stores, computers, software and skills.	(+) clear strategy and supporting mechanisms in place.
	MS48	Action 4: Adopt and implement national strategies for electronic identity for researchers giving them transnational access to digital research services	JISC has launched UK Access Management Federation for Education and Research.	(+) UK is actively exploring options for a system to deliver electronic identity for researchers. JISC has a programme operating in this area.

REFERENCES

BIS (2012) Annual Innovation Report. 2012. Available at: http://www.bis.gov.uk/assets/biscore/innovation/docs/a/12-p188-annual-innovation-report-2012.

BIS (2012). *A Review of Business–University Collaboration*. February 2012.Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32383/12-610-wilson-review-business-university-collaboration.pdf

BIS (2013). Science, Engineering and Technology Statistics 2013. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/246231/13-499-set-statistics-2013A.pdf

BIS (2013). *Future of manufacturing: a new era of opportunity and challenge for the UK*. (Foresight project report). BIS, October 2013. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/255923/13-810-future-manufacturing-summary-report.pdf

BIS (2013). *Professor John Perkins' review of engineering skills*, BIS, November 2013. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/254885/bis-13-1269-professor-john-perkins-review-of-engineering-skills.pdf

BIS (2013). *Encouraging a British Invention Revolution: Sir Andrew Witty's Review of Universities and Growth*, October 2013. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/249720/bis-13-1241-encouraging-a-british-invention-revolution-andrew-witty-review-R1.pdf

BIS (2013) *International Comparative Performance of the UK Research Base – 2013*, Ref: BIS/13/1297. December 2013. Available at: https://www.gov.uk/government/publications/performance-of-the-uk-research-base-international-comparison-2013.

BIS (2014). *Insights from international benchmarking of the UK science and innovation system*. Ref: BIS/14/544, February 2014. Available at: https://www.gov.uk/government/publications/science-and-innovation-system-international-benchmarking

Business Growth Fund, 2013. Branching out. How Growth Capital can seed success. Review 2012/13. Available at: http://www.businessgrowthfund.co.uk/wp-content/uploads/2013/07/Review-2013.pdf

Cunningham, P., Sveinsdottir, T. and Gok, A. (2011) ERAWATCH COUNTRY REPORTS 2011: United Kingdom.

Cunningham, P. and Sveinsdottir, T. (2012). Innovation Policy Trends in the United Kingdom. INNO-Policy TrendChart Report. Technopolis.

European Commission, *The 2013 EU Industrial R&D Investment Scoreboard*. Luxembourg 2013.

Eurostat (2013a) Demographic Balance and Crude Rates. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_gind&lang=en

Eurostat (2013b) Annual National Accounts: GDP and main components. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_gdp_c&lang=en

Eurostat (2013c) GDP growth rate volume. Percentage change on previous year. Available at: http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tec00115&plugin=1

Eurostat (2013d). Total intramural R&D expenditure (GERD) by sectors of performance. Available at: http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do.

Eurostat (2013e) Total Intramural R&D Expenditure (GERD) by sectors of performance. Available at: http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=t2020_20&plugin=1

Eurostat (2013f). Human resources in science and technology as a share of labour force. Available at: http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tsc00025&plugin=1.

HM Government, Framework of European Growth Programme Policies: Background Analysis, July 2013. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/232306/13-1049ann-framework-of-european-growth-programme-priorities.pdf

HMRC, 2010. An Evaluation of Research and Development Tax Credits. HMRC Research Report 107. Available at: http://www.hmrc.gov.uk/research/report107.pdf

HMRC, 2013, Research and Development Tax Credit Statistics, August 2013. Available at: http://www.hmrc.gov.uk/statistics/research-tc/rd-introduction.pdf

HM Treasury, Investing in Britain's Future. CM 8669, Her Majesty's Stationery Office, June 2013. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209279/PU1524_IUK_new_template.pdf

House of Commons Science and Technology Committee (2013). *Bridging the valley of death: improving the commercialisation of research*. Eighth Report of Session 2012–13. March 2013. Available at: http://www.publications.parliament.uk/pa/cm201213/cmselect/cmsctech/348/348.pdf.

No Stone Unturned: in pursuit of growth. Heseltine Review, March 2013. https://www.gov.uk/government/publications/no-stone-unturned-in-pursuit-of-growth

Office for National Statistics (2014). *Statistical bulletin: UK Gross Domestic Expenditure on Research and Development, 2012*. Available at: http://www.ons.gov.uk/ons/rel/rdit1/gross-domestic-expenditure-on-research-and-development/2012/stb-gerd-2012.html#tab-Expenditure-on-R-D-Performed-in-the-UK

Richardson, K. and Korou, A. Smart Specialisation and the LEP based model across England. Presentation made 25 June 2013, Department for Business, Innovation & Skills.

LIST OF ABBREVIATIONS

AHRC	Arts and Humanities Research Council
BBSRC	Biotechnology and Biological Sciences Research Council
BERD	Business Enterprise Expenditure on R&D
BIS	Department for Business, Innovation and Skills
CBI	Confederation of British Industry
CIHE	Council for Industry and Higher Education
CSA	Chief Scientific Adviser
CSR	Comprehensive Spending Review
CST	Council for Science and Technology
DAs	Devolved Administrations
DCLG	Department for Communities and Local Government
DCMS	Department for Culture, Media and Sport
DEFRA	Department for Environment, Food and Rural Affairs
DFID	Department for International Development
DH	Department of Health
EPSRC	Engineering and Physical Sciences Research Council
ERA	European Research Area
ESFRI	European Strategy Forum on Research Infrastructure
ESRC	Economic and Social Research Council
FE	Further Education
fEC	Full Economic Costing
FP	European Framework Programme for Research and Technology Development
G7	Group of seven industrialised nations
GBAORD	Government Budget Appropriations or Outlays for R&D
GDP	Gross Domestic Product
GERD	Gross Expenditure on R&D
GSIF	Global Science and Innovation Forum
HE	Higher Education
HE-BCI	Higher Education-Business and Community Interaction
HEFCE	Higher Education Funding Council for England
HEI	Higher Education Institutions
HEIF	Higher Education Innovation Fund
HERD	Higher Education Expenditure on R&D
HMRC	Her majesty's Revenue and Customs (Tax Agency)
HM Treasury	Her Majesty's Treasury (Finance Ministry)
KTN	Knowledge Transfer Network
KTP	Knowledge Transfer Partnership
LCFC	Large Facilities Capital Fund
LEP	Local Economic Partnership
MoD	Ministry of Defence
MRC	Medical Research Council
NAO	National Audit Office
NERC	Natural Environment Research Council
NESTA	National Endowment of Science Technology and the Arts
NHS	National Health Service

NRP	National Reform Programme
OECD	Organisation for Economic Co-operation & Development
ONS	Office for National Statistics
PRO	Public Research Organisation
PSA	Public Service Agreement
PSRE	Public Sector Research Establishment
RAE	Research Assessment Exercise
RCIF	Research Capital Investment Fund
RCUK	Research Councils UK
RDA	Regional Development Agency
REF	Research Excellence Framework
RTO	Research Technology Organisations
S&T	Science and Technology
SBRI	Small Business Research Initiative
SET	Science, Engineering and Technology
SME	Small and Medium-sized Enterprise
STEM	Science, Technology, Engineering & Mathematics
STFC	Science and Technology Facilities Council
TSB	Technology Strategy Board
UKTI	UK Trade and Investment
UTC	University Technical College

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